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PARTIAL LIST OF CONTRIBUTORS TO VOLUME VII

AUSTIN, OSCAR P.
Statistician, National City Bank of New York

COMMERCE, HISTORY OF
COMMERCE, INTERNAL, OF THE UNITED STATES
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Assistant Professor of English, Yale University

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Chicago, Ill.

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Associate Professor of American Literature, University of Wisconsin

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Professor of Romance Languages, University of Michigan

CONTES BLEUS

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Historian, Society of Colonial Wars, New York

COLONIAL WARS, SOCIETY OF

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Librarian, Newberry Library, Chicago

CLEVELAND, GROVER

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DEIMEL, R. F., B.S., M.A.
Assistant Professor of Mechanics, Stevens Institute of Technology, Hoboken, N. J.

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COMBINATIONS AND PERMUTATIONS

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Contributors to Volume VII — Continued

DITTMER, C. E.
Editor "City Bulletin," Columbus, Ohio
COLUMBUS, OHIO

DODD, WILLIAM E., Ph.D.
Professor of American History, University of Chicago
CLAY, HENRY

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Consulting Civil and Military Engineer
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Formerly Professor of Pharmacognosy, Columbia University
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COITUS

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CONTAGION

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Formerly Lecturer on Public Speaking at Saint Andrew's College, University of Sidney, Australia, and Lecturer for the Department of Education, New York
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COMMUNITY DRAMA
COMMUNITY MUSIC

MOORE, WILLIS L., LL.D., D.Sc.
Professor of Meteorology, George Washington University
CLIMATE

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Professor of Municipal Government, Harvard University
COMMISSION FORM OF GOVERNMENT

NOTT, HON. CHARLES C.*
Chief Justice Court of Claims
CONSTITUTION, IMMUTABILITY OF THE

NOURSE, EDWARD E., D.D.
Professor of Biblical Theology, Hartford Theological Seminary
CORINTHIANS, EPISTLES OF PAUL TO THE

* Deceased

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O'HEARN, DAVID D.C.L.
Saint Francis Sery, Milwaukee
CONGREGATIONTHE SACRED

OSGOOD, WILLIAM, Ph.D., LL.D.
Professor of Mattics, Harvard University
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COMMERCIALAW
COMMON LAW
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Astronomical Obstory, Harvard
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TAYLOR, WILLIAM J., Ph.D.
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Author of "The Popes and Science," etc.
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Professor of French Language and Literature, Harvard University
CONSUELO

YERKES, ROBERT M., Ph.D.
Professor of Psychology, University of Minnesota
COMPARATIVE PSYCHOLOGY

KEY TO PRONUNCIATION.

ä	far, father
ā	fate, hate
a or ă	at, fat
â	air, care
ạ	ado, sofa
ȧ	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie.*
ẹ	befall, elope
ë	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or ʜ	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
ï	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*

ñ	Span. *ñ*, as *cañon* (căn'yŏn), *piñon* (pēnŏn)
ng	mingle, singi
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symb
ọ	book, look
oi	oil, soil; al Ger. *eu*, as in *beutel*
ö or oo	fool, rule
ou or ow	allow, bowrit
s	satisfy, sae
sh	show, sure
th	thick, thin
th̲	father, thner
ū	mute, use
u or ŭ	but, us
u̇	pull, put
ü	between and e, as in Fr. *sur*, Ger. *Mller*
v	of, very
y	(consonantal) yes, young
z	pleasantrose
zh	azure, easure
'(prime), "(secondary)	accents, to indicate syllabicstress

THE ENCYCLOPEDIA AMERICANA

C

CIVIL LIST, a term signifying in the United States, (1) a list of the entire expenses of the civil government, (2) the revenue appropriated to support civil government, (3) the officers of the civil government who are paid from the public treasury.

In England the meaning of the term formerly represented the whole expenses of the government with the exception of those of the army, navy and other military departments. It is now limited to expenses proper to the maintenance of the household of the sovereign. It was once a principle in England, as also among Teutonic nations, that the monarch was to pay all the expenses of government, even including those of the army, from the possessions of the Crown, the domains, and that the subjects were not obliged to contribute anything more than they voluntarily engaged to. From this principle, which is proved by the history of the origin of the domains, it appears that the Crown lands in general cannot be considered the private property of the ruling family. On the contrary, they are, in general, the property of the state and have been given to the prince to defray the expenses of government. Until the Restoration the whole expenses of the government continued to be defrayed out of the royal revenue. The first Parliament of Charles II fixed on £1,200,000 as the ordinary revenue of the Crown in time of peace. For this they provided by taxation, which ultimately produced more than the amount of the grant. The same taxes were continued during the reign of James, and produced on an average £1,500,000, in addition to which he received extraordinary grants. At the commencement of the reign of William, the Commons made still further restriction on the royal control of the revenue. They voted £1,200,000 as the revenue of the Crown in time of peace, one-half of which was appropriated to the maintenance of the king's government and the royal family, the other to public and contingent expenditure. The outbreak of war prevented this arrangement from being strictly carried out, but the Commons maintained the principle of separating the regular and domestic expenses of the king from the public expenditure, and establishing a systematic and periodical control over the latter. The amount actually voted to the king for life in 1697 was £700,000 and the same vote was made at the commencement of the reigns of Queen Anne and George I. On the accession of George II £830,000 was voted. Besides the regular vote, grants had been frequently made to defray debts incurred in the expenditure of the sovereign. On the accession of George III the civil list was fixed at £800,000, but instead of being paid out of the appropriated revenues in which the Crown lands were included, these were surrendered, and it was charged on the ordinary taxation. Large extra grants had to be made during this reign. At the commencement of the reign of Victoria a civil list of £385,000 per annum was settled on her majesty for life for the support of the royal household, and the maintenance of the dignity of the Crown, £60,000 being allotted to the privy purse. In 1901 the civil list of the king of England was raised to £470,000; £110,000 of this being for the privy purse.

CIVIL PROCEDURE. See COURT.

CIVIL RIGHTS BILLS. 1. An act to carry out the intention of the 13th Amendment, prohibiting slavery — which it was alleged the Southern States were attempting to nullify by public and private action — and secure the political equality of the ex-slaves with the whites. It provided that all persons born in the United States and not subject to any foreign power, excluding Indians not taxed, were citizens of the United States and entitled to the same immunities, irrespective of race or color, or previous condition of servitude, except as punishment for crime; punished as a misdemeanor any deprival of such right under color of State law; transferred cognizance of such cases from the State to the Federal courts; entrusted the execution of the act to national officers only, and fined them for refusal; punished resistance to the officers; provided for fees; empowered the President to send officers to any district where the act was likely to be violated, and to call out the national forces to execute it; but permitted an appeal to the Supreme Court. Significantly, it employed somewhat the same means to emancipate the negro which the Fugitive Slave Law did to re-enslave him, especially in overriding or supplanting State officers; and for the same reason — they could not be trusted in the sections where it was to be enforced. The bill was passed in the Senate 2 Feb. 1866, 33 to 12; in the House 13 March, 111 to 38. Andrew Johnson vetoed it 27 March, and it was passed by the requisite two-thirds over his veto, in the Senate 6 April and in the House 9 April. Even so, the debate had brought out two grave doubts of its constitutionality; that the protection of civil rights under the Constitution belonged not to Congress but to the States, and that under the Dred Scott decision (which stood as a precedent for the Supreme Court until reversed), negroes could not become citizens even by emancipation. This led to the proposal of the 14th Amendment (see CONSTITUTION, *Amendments*), which passed both Houses in June.

2. An act extending the foregoing to the exclusion of negroes from juries and from equal privileges in schools, public conveyances, hotels, theatres, etc. This had been persistently urged by Charles Sumner, for some years before his death; was offered as an amendment to the Amnesty Bill of 1872, and lost by only one vote; again introduced into the House in December, and referred to a committee; on 30 April 1874, a few weeks after Sumner's death, it passed the Senate, but the House rejected it; it finally passed both Houses in February 1875 and was signed 1 March. For an account of its partial invalidation, see next article.

CIVIL RIGHTS CASES. These were five test cases in the United States Supreme Court of the constitutionality of sections 1 and 2 of the second Civil Rights Bill, described above; decided in one group, October term, 1893, and reported and cited under the title above. All came up from Circuit Courts; three on certificates of division of opinion, two on appeal for error; and while the decision on the act was adverse to all, and the first three were found for defendant, the error was admitted and the decision given for plaintiff in the last two. Two of them were for hotel discrimination, two for theatre discrimination, one for railroad discrimination; the first four submitted 7 Nov. 1882, the last one 29 March 1883. The cases were: U. S. *v.* Murray Stanley, from the Kansas district: hotel case. U. S. *v.* Michael Ryan, California district: refusing a negro a seat in the dress circle of Maguire's Theatre, San Francisco. U. S. *v.* Samuel Nichols, Western Missouri district: hotel case. U. S. *v.* Samuel D. Singleton, southern New York district; refusing a negro a seat in the Grand Opera House, New York. Richard A. Robinson and Sallie A. Robinson, his wife, against the Memphis and Charleston Railroad Company: refusal to allow the wife a seat in the ladies' car from Grand Junction, Tenn., to Lynchburg, Va. The decision of the court was given by Justice Bradley, Harlan dissenting. The terms of the first section of the act are that «All persons within the jurisdiction of the United States shall be entitled to the full and equal enjoyment of the accommodations, etc., of inns, public conveyances by land or water, theatres and other places of public amusement,» and that laws must be «applicable alike to citizens of every race and color, regardless of previous condition of servitude.» The second section affixes penalties. The court held that these two sections are unconstitutional as applied to the States, not being founded on either the 13th or 14th Amendment (see CONSTITUTION, *Amendments*): the former merely prohibits slavery, which is not constituted by a denial of civil equality; the latter is prohibitory merely on the States, not on individuals, and it was not alleged that the discrimination was made under State laws. Congressional legislation for enforcing the latter amendment is not direct legislation, but corrective, counteracting or redressing State legislation of a sort forbidden by the amendment. For private injury from discriminations, the remedy must be sought in State laws — to withdraw it from which was the precise object of the act.

CIVIL SERVICE, that branch of the public service which includes all executive offices not connected with the army or navy. The term is not applied to the direct representatives of the people, as the President of the United States or the governor of a State. Owing to the complexity of modern government and the variety of its functions, the civil service has become very complex, and the problem of its effective administration a difficult one.

In Great Britain the service comprises various departments, such as the home office, the foreign office, the war office, admiralty, post office, customs, excise, etc. Formerly, appointments to the civil service in Great Britain were the gift of the executive government, and were obtained by influence, while the bestowal of them was used as a means of gaining parliamentary support on behalf of the government. Those appointed were not generally called upon to show whether they were competent or not. In 1855 examinations were instituted to test the efficiency of all candidates for subordinate posts; but for some time candidates were specially nominated for those posts. As more than one might be nominated for a post, competition was gradually introduced, and in 1870, it was directed that appointments in the civil service should (with certain exceptions) be filled by open competition, as was already the case with appointments in the Indian civil service. The appointments to what are known as clerkships in the civil service are divided into two classes or divisions, with different age limits and salaries. In the higher division, while the examinations are more severe, the salaries are much better; the two divisions are kept quite distinct; and it is rare for a person to be promoted from the lower to the higher. For a number of appointments open to competition special qualifications, scientific or technical, are necessary, while there is also a special limit of age. A large number of subordinate appointments in the postal and telegraph service, the excise, etc., are on a different footing from the clerkships just mentioned and are not so well paid. All persons who have served in an established capacity in the permanent civil service are given a pension, varying with the length of service, at the time of retirement. The total expenditure of the civil service of Great Britain is about $90,000,000.

In the United States the Constitution provides that the President, «with the advice and consent of the Senate,» shall appoint all officers of the United States whose appointments are not otherwise provided for by the Constitution. This gives the chief executive power to choose the heads of departments, as well as their subordinates. In the separate States the appointive power of the chief executive is much more limited. The heads of the State departments such as the attorney-general and comptroller, etc., are elected by the people, and usually have the constitutional right to select most of their own subordinates. The governor therefore appoints only his own secretaries, etc., members of commissions, heads of bureaus and the like. With the development of party government in the United States, the patronage placed in the hands of elected officers through their power of appointment has led to the giving of offices as a reward for party service (the spoils system) and to considerable inefficiency and unnecessary expense in public administration. A reform is being brought about by the appointment of officials according to merit in public examinations. (See CIVIL SERVICE REFORM). On 30 June 1915 the civil service positions under the Federal government numbered 454,116, of which 9,692 were appointed by the President. To these may be added 28,605 positions under the civil government of the Panama Canal Zone, making a total of 482,721 positions in the government service.

CIVIL SERVICE REFORM, the improvement of the civil service in methods of appointment, rules of conduct, etc.; in the United States, the movement for the appointment of public servants according to their fitness for their work, rather than their services to the party in power.

In the year 1835 a debate took place in the Senate of the United States on the condition of the civil service, and especially on the abuse of the power of appointment and removal to serve party ends instead of public ends. Among the senators who took part in the debate were the three whom history has judged the strongest in that famous body, Daniel Webster of Massachusetts, Henry Clay of Kentucky and John C. Calhoun of South Carolina. Differing widely in their views of party policy and rivals in ambition, they were of one mind as to the true nature of the public service and as to the errors and evils that had crept into it. Mr. Webster, then in the prime of his young manhood, had already won the title of the «Great Expounder of the Constitution.» He thus stated the idea in which the others heartily joined: «The theory of our institutions is plain; it is that government is an agency created for the good of the people, and that every person in office is the agent and servant of the people. Offices are created, not for the benefit of those who are to fill them, but for the public convenience.»

There is no doubt that this is indeed the true theory of our institutions. It is to be found in all the early writings of the men who formed the government. It is the basis of the Declaration of Independence, that «governments are instituted among men» to secure the rights of «the governed» from whose consent «they derive their just powers.» When our national government was founded it was the only one in which offices were not a privilege, but a trust, imposed by the choice of the people and for their sole interest. Neither birth nor rank nor wealth gave any title to them. Each of the men who held them was intended to be, in the words of Webster, «the agent and the servant of the people.»

This theory had grown out of the needs of the American people, and fitted them closely. As colonists they had had to work and fight hard for the right to live and the means to live as free men in a wild land, far from the homes of their fathers, amid many perils and hardships. There was no ruling class among them. To attend to the common business of each little settlement, they were led to choose among their own number the agents best fitted for the task. These in the early days were, as in the towns of New England they still are, «select-men,» «trustees.» The name shows what was expected of them, and what was their title to employment. As the towns were grouped in counties and the counties in States, the public business grew, became more complex and required a larger number of agents with different duties and powers, but the idea held. They were still agents, selected men, trustees. From the most modest unpaid village or town officer to the President of the United States, the commander-in-chief of the army and navy of the nation and its representative in the eyes of the world, no man in the public service in this country is anything but the agent, the trustee of the people.

One result of the growth of the public business has been that only a small part of the agents for doing this business are chosen directly by the people. Those thus chosen are entrusted with the employment or appointment of a very large number of others. The chief difference between the two classes is that those elected are expected to carry on the public business in a way that the majority of the voters are in general agreed upon. They are the choice of the majority party and, so far as the rights of all permit, they are the agents of that party. When the views and wishes of the majority change, these agents are usually changed also. But the far greater number of agents for doing the public business are appointed or employed. The duties of nearly all these are the same no matter what may be the policy of the majority party. In the national government, for instance, the main work for those in office, except the highest, is the collection and expenditure of the taxes. The taxes are collected on goods brought into this country for sale or on goods made here for sale; in other words, customs, duties, and internal revenue taxes. Parties differ widely as to which class of taxes should be the higher, and as to how high the custom duties should be. But all parties agree that the taxes of all sorts should be collected according to law honestly and fairly, that the money should be carefully accounted for and none of it stolen or wasted. Agents for this purpose need to be good business men of character and ability; they do not need to be of one party or another. Again, the Post-Office Department does a great part of the business of the government. It collects mail matter of all kinds, transports it, delivers it at home or abroad, makes large payments on money orders and sells the stamps by which the cost of its work is paid. As to this work, there is no difference at all between parties and there has never been. The agents engaged in it need only to be honest and efficient. They do not need to be of one party or another. In all offices where the duties are of this sort, it is plain that those engaged in them should be selected for merit only, promoted as the service requires and removed only for failure or incapacity to do their work in the best manner.

Such a policy would answer to Webster's statement of the theory of our institutions and to the practice of the early Presidents. Washington declared: «In every nomination to office I have endeavored, so far as my own knowledge extended or information could be obtained, to make fitness of character my primary object.» In the first 39 years of the history of the government the six Presidents made only 112 removals. A few years later, when Webster had to define anew the true theory of the public service, a very different practice had grown up. It was frankly described in that same debate by Mr. Marcy, a senator from New York. He said: «The politicians of the United States are not so fastidious as some gentlemen are as to disclosing the principles on which they act. They see nothing wrong in the rule that to the victor belongs the spoils of the enemy.» This theory is plainly the opposite of the true one. Under it elections do not merely settle the policy of the country, as to which parties may unselfishly differ. They become contests for spoils as well and tend to become more and more contests for spoils and less disputes as to principle. The spoils are the offices; the places of trust and these tend to be given not to those best fitted to perform their duties, but to those who have claims on the party. The service is hurt by putting out tried men and putting in untried men and since the untried men are chosen for other reasons than fitness, they are apt to be poorer officers. Since they owe their employment to party favor and do not get it on their merits, they are likely to be less faithful and less honest. They are liable to be turned out at the next election and they are tempted to make all they can from their places. The offices tend to be regarded as created not «for the public convenience» but «for the benefit of those who fill them.» The service tends to become poorer, less honest, more costly. Any large private business conducted in this way would surely come to disaster. So would the business of the government if it had not the pockets of the taxpayers to draw from.

The Spoils System.— The spoils system prevailed in the service of the United States government for about a half-century after 1830. It also prevailed in greater or less degree in the service of the several States and of the larger cities. It was not confined to any one party. All were more or less corrupted by it. The effect on the politics of the country was very bad. The pressure for public employment, always strong, became extreme. Probably the election of 1860 was as largely decided by moral conviction as any in the history of the country. Yet, one month after he took office, President Lincoln groaned under the burden of this pressure. «I wish,» he wrote, in his simple phrase, «I could get time to attend to the Southern question. I think I know what is wanted and believe I could do something toward quieting the rising discontent, but the office-seekers demand all my time. I am like a man so busy letting rooms in one end of his house that he cannot stop to put out the fire that is burning in the other.» In the crisis of the war for the Union he was visited by a committee of New York politicians, intent on patronage. The chairman opened his address with a reference to the «awful burden of the nation's fate weighing on the president.» «Gentlemen,» interrupted Mr. Lincoln, «it is not the fate of the nation that worries me most just now; it is your pesky post office.» These incidents throw a strong light on the waste of time, of money and of strength imposed by the spoils system. The degradation and pollution of politics were even worse effects. The office-holders, living on the spoils of the place and greedy for more, seized the organization of their party, whichever it happened to be, and made the free exercise of honest preference among the voters difficult and often impossible. The scramble between factions in the party in possession became as intense as between opposing parties. In the custom house in New York, five collectors of the same party made 1,878 removals in a period of 1,565 business days and the service grew steadily worse. In 1881, Guiteau, an office-seeker from New York, where a bitter factional fight had long been raging, half-crazed with disappointed greed, assassinated President Garfield, to whom he charged his failure.

The Merit System.— This proved the turning point. At the next session of Congress bills were introduced for the establishment of the merit system and a law was passed in January 1883. It was entitled «An Act to Regulate and Improve the Civil Service of the United States.» The object of the law was to secure appointment and promotion in the service for fitness. For this purpose appointments were to be made from those graded highest as the results of open competitive examinations, the appointments being made final only after a period of probation or trial. This system was to be extended throughout the service as fast and as far as the President should direct. When any part of the service was to be brought under the system, it was to be arranged in classes by order of the President; hence the term «classified service» means, under the law, the part of the service in which the merit system is applied. Within the classified service, the examinations for appointment and for promotion are chiefly competitive; that is to say a list, called an «eligible list,» is made of all applicants passing a fixed grade, in the order of their standing, and a selection is made by the appointing officer from the three highest on this list. This selection is for the period of probation or trial, six months, at the end of which term, if his conduct and capacity are satisfactory, the probationer is absolutely appointed; if not, he is discharged. Non-competitive examinations are held according to the rules laid down by the President. In these all applicants passing a fixed grade are eligible to appointment without regard to their relative standing. The rule as to probation is the same as in the other cases. The law requires that all «examinations shall be practical in their character and as far as may be shall relate to those matters which will fairly test the relative capacity and fitness of the persons examined to discharge the duties of the service to which they seek to be appointed.» Close attention is paid to this requirement. In the first place, weight is given to the experience of the candidates in the kind of work they seek, when such experience can definitely be known. Then each class is tested as to knowledge and skill particularly needed. For clerks and accountants, weight is given to accuracy and quickness in figures, to clearness and rapidity in writing and to familiarity with the principles and methods of bookkeeping. Examinations are generally for entrance to the lower grades of the service and actual excellence in the performance of work counts in promotion. For places requiring special knowledge, trained examiners are employed. For instance, the examiners who set the questions and rated the answers in the case of the supervising architect were prominent architects from various parts of the country. They were able, from the records of the candidates, to test not only professional knowledge, but business capacity. In all cases the examiners are selected from those who are well informed as to the work to be done. The application of this law is to be carried out and watched by a commission, known as the United States Civil Service Commission, made up of three members, appointed by the President with the advice and consent of the Senate. This commission aids the President in the formation of the rules under the law, and, with the aid of examiners, sets and conducts the examinations. All appointing officers are required to report to it all changes in the classified service, of which the commission keeps a full record, as well as of its own examinations and other proceedings. All officers of the service are required to aid in the performance of the duties of the commission.

One of the worst evils of the spoils system was the fact that public employees were made to pay a large fraction of their salaries to party funds, and another was that these employees were forced to work for the party in power in order to keep their places. Both these practices are now forbidden by law in the service of the United States. No one in the service is allowed to use his official authority or influence to coerce the political action of others. All persons in the service are forbidden to ask or receive political contributions from others in the service. Such contributions cannot be solicited in any place or building used by the government. By the rules, which have the force of law, no question can be asked of candidates for appointment as to their political or religious opinions; no disclosures of such opinions can be considered; no change of rank or pay can be made because of such opinions. Under the spoils system, the office-holder got his place from his party and was taxed heavily by his party managers. The law intends to put a stop to that; it holds the officer bound only to earn his pay by honest work, and free to spend it as he chooses. The law further holds him without fear of harm or hope of aid from outside, to do his duty to his employers, the whole people of the United States. It aims to put the people and those who work for them on the same footing that is maintained in honorable private business between employers and employed.

The merit system has been greatly extended since the passage of the law. Under President Arthur, who signed the law in 1883, some 16,000 places were brought within its provisions. The number is now over 120,000. While this advance has been made there have been more frequent changes of party in the government of the country than in any like period in our history. Each succeeding President, until the present, has, in the discretion which the law confides to the President only, added to the number of places removed from the spoils system. President McKinley withdrew a considerable number of places from the merit system for reasons urged upon him by the heads of some departments. The effect has been unfortunate. President Taft, near the close of his administration, transferred all the fourth class postmasterships to the classified service. President Roosevelt increased the number by including the deputy collectors of customs and internal revenue. The merit system has been extended to the service in the Philippine Islands in a way that promises to make the work of governing there clean, efficient and fair to a degree that could hardly have been looked for. In this region the bond of trusteeship rests upon our government with a peculiar and solemn obligation. The United States have taken control of the affairs of the people of these islands as the result of a war with Spain, without the assent of the people in the first instance, and against resistance by a portion of them which was overcome by arms. It would be a sore disgrace if their affairs were not managed honestly and purely and for the interest of the governed. The merit system on the lines of the Civil Service Law has been established there, under the general guidance of an experienced and skilled examiner from Washington. As many natives as practicable are being employed. It is still too early to judge of the final outcome, but the beginning is promising.

The chief aim of the merit system is, on the one hand, to get the best service for the government — that is, for the people — and, on the other hand, to remove from the party contests of the country the corrupting influence of the vast number of business places offered as spoils to the victors. The methods of competition and probation are not perfect, and, like all other human methods, are liable to mismanagement. But they are the best that have ever been tried, and they are very effective. The test of competitive examination is shown to be thorough and practical by the fact that only a very small number of those who pass that test are dropped after probation or trial. Another proof is the much larger amount of work done by persons so selected. During 10 years before the adoption of the merit system in the departments at Washington the number of clerks increased from 3,300 to 5,523, or more than two-thirds. In the 13 years after the system was adopted the number actually fell off 211, or 3 per cent, while the work of the departments had largely increased. Another proof of the efficiency of the system is the small number of changes that take place in it compared with those that take place in the branches of the service where the system is not yet applied.

The entrance examinations are held in all parts of the land, and men and women are selected for the departments at Washington with no regard whatever for their party views or the influence of politicians. This has been of great effect in laying to rest the passions bred by the Civil War, and giving to the dwellers in the South a sense of their common rights and duties as citizens of the nation. It is a great and lasting gain.

In 1884, laws for the introduction of the merit system were enacted in New York and Massachusetts, and later laws authorize the system in the service of cities in Wisconsin and Illinois. In Massachusetts and in New York the system has made much progress and the results have been good in proportion as the system has been extended and honestly and faithfully applied. But the evils of the spoils system still prevail almost without check in the service of the cities and the States throughout the country. The enormous number of places involved are still almost wholly the prizes of party contests. The place-holders, many times more numerous than the present army of the United States, are in greater part enlisted for party rather than for public service. Efficiency, industry and economy in the public work are hard to secure. The suppression of vice and the decent administration of the affairs of cities and States are made more difficult.

Clearly it is best that the merit system should be applied to all that portion of the civil service in which the duties are of a business nature and in which the office-holders are not called on to fix the policy of the government. There is no Democratic or Republican or Populist way of being honest and industrious and intelligent which all Americans may not use. To these qualities in their service the people have a right, and no party can claim a monopoly of them. Much remains to be done to complete the work so well begun. The men in all parties who look on public employment, not as a trust, but as the spoils of party victory, resist all advance and seek to undo what has been done. They cannot succeed if the true nature of the merit system is understood, its honesty and fairness, its high utility and its fidelity to the fundamental principle of the free institutions of the American republic. From 1915 on the Civil Service Reform League conducted a vigorous agitation to bring all classes of postmasters into the classified service, all diplomatic secretaries and consular officers to be transferred to the classified service. The League also co-operated by request to ensure efficiency in war service. Consult Roosevelt, Theodore, ‹American Ideals› (New York 1900); Fish, C. R., ‹The Civil Service and the Patronage› (New York 1905). See EXECUTIVE.

CIVIL WAR IN AMERICA. The number of engagements entered in the government's ‹Chronological List of Battles› exceeds 2,200. An alphabetical list of battles compiled at the bureau of pensions, including such minor actions and skirmishes as seemed worthy of incorporation, contains over 6,800 separate affairs. It is therefore clear that, even in a comprehensive narrative of the War, a large number of the lesser engagements must be ignored. Merely to state strength and losses for the battles mentioned would form a lengthy statistical article. For these figures the student is referred to the separate accounts in this work of the various battles herein treated.

The Civil War of 1861–65 was inaugurated by the determination of seven Southern States to withdraw from the Union. (See UNITED STATES — CAUSES OF THE CIVIL WAR; EFFORTS TO SETTLE THE SLAVERY QUESTION). South Carolina led by passing an ordinance of secession 20 Dec. 1860, followed by Mississippi, 9 Jan. 1861; Florida, 10 January; Alabama, 11 January; Georgia, 19 January; Louisiana, 26 January; and Texas, 1 February. On 7 February the Choctaw Nation declared its adherence to the Confederacy. See UNITED STATES — SECESSION; SECESSION IN THE UNITED STATES.

During the autumn of 1860 and the early spring of 1861 the forts, arsenals, customhouses and other government property in those States, with few exceptions, had been seized by State troops, and large sums were voted for arming the States, Georgia leading in November 1861 by appropriating $1,000,000. Maj. Robert Anderson, a Federal officer, who held Fort Moultrie on the inner line of Charleston harbor, becoming aware of active preparations for capturing that work, withdrew, on the night of 26 December, to Fort Sumter (q.v.) in the centre of the harbor. This move hastened results. Immediate preparations were made for bombarding the fort. The first firing upon the flag was 9 January by the batteries erected against Fort Sumter, the inciting cause being the appearance of the *Star of the West* (q.v.) off the harbor. This vessel had been sent from New York with provisions for Sumter, and with the accompanying fleet withdrew without replying to the fire.

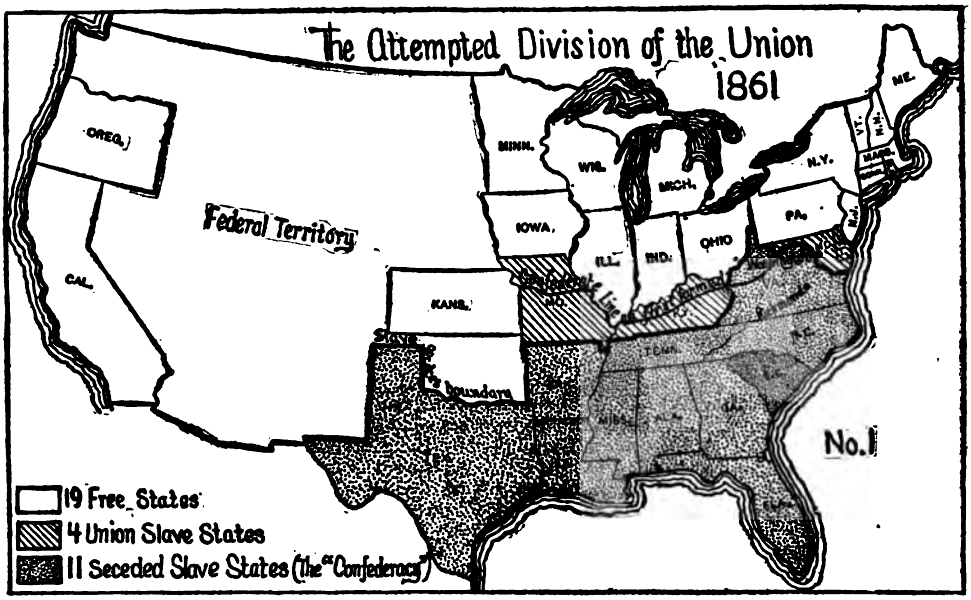
Delegates from the seceded States met at Montgomery, Ala., 4 February, and 8 February adopted a provisional government, «The Confederate States of America» (q.v.) and the next day elected Jefferson Davis of Mississippi President, and Alexander H. Stephens of Georgia Vice-President of the Confederacy. See UNITED STATES — THE CONFEDERACY; CONFEDERATE STATES OF AMERICA.

On 1 March Gen. P. G. T. Beauregard, appointed by the Confederate government, was sent to Charleston and took charge of the preparations for reducing Fort Sumter. On 4 March Abraham Lincoln was inaugurated as President of the United States. On 10 April Beauregard was instructed to demand the surrender of the fort, and, in case of refusal, to reduce it. The next day Anderson received and promptly declined a demand to evacuate, and at daylight 12 April, the Confederate batteries opened upon Fort Sumter, compelling its surrender on the 14th. The expectation of a relieving fleet probably hastened this attack. See FORT SUMTER.

With the news of the attack and surrender the country received President Lincoln's proclamation calling for 75,000 volunteers, and summoning Congress to meet on 4 July. In an instant discussion over the power to coerce States, the discussion of peace conventions and movements and all similar perplexing questions were brushed aside, and the North responded with intense enthusiasm, the predominating sentiment being the preservation of the Union. The South was equally aflame, rallying under the banner of State rights.

On 8 April President Davis had called for 20,000 volunteers, and the day following President Lincoln's proclamation he asked for 34,000. Two days later the Confederate Congress authorized the raising of 100,000 men. Three days after the surrender of Sumter Virginia seceded, followed 6 May by Arkansas and Tennessee, and 20 May by North Carolina, the belief being then general that a policy of coercion had been decided upon. The border States of Kentucky and Missouri were held to the Union by their loyal element, and Maryland was held at first by the direct power of the national government, and later by its own loyalty. The first two were represented in the Confederate Congress throughout the War. The movement to take Missouri into the Confederacy was thwarted by Gen. Nathaniel Lyon, who captured Camp Jackson near Saint Louis 10 May, and on 17 June, having already taken the State capital, in a brief engagement dispersed a force which Governor Jackson had gathered at Booneville. This resulted in relieving the capital from those plotting secession. Kentucky at first declared for neutrality, but at the election for members of Congress, 20 June, it was made clear that the State was lost to the Confederacy. In May the Confederate capital was moved from Montgomery, Ala., to Richmond, Va., where troops from all parts of the Confederacy were rapidly assembling. In like manner, the Northern States were pouring troops into the national capital, and Washington soon became a vast military camp. The Union forces crossed into Virginia 24 May and encamped opposite Washington.

For a brief time Baltimore resisted the passage of troops to the capital. Four hundred Pennsylvanians reached Washington 18 April, but the 6th Massachusetts regiment was attacked in Baltimore 19 April. The 7th New York reached Washington 25 April from Annapolis. Brig.-Gen. B. F. Butler, with the 8th Massachusetts, had reached Annapolis on the 20th, and on the 22d had proceeded to the Relay House. On the night of 13 May he occupied Baltimore, and thereafter the route to Washington was unobstructed. Harper's Ferry (q.v)., with its arsenal and machinery for manufacturing small arms partially destroyed, was seized by the Confederates 19 April (see SHENANDOAH VALLEY), and Gosport Navy Yard, near Norfolk, 20 April, with guns, stores, ships and machinery of immense value.



On 20 May General Butler, having been made a major-general of United States volunteers, was assigned to the command of the Department of Virginia and North Carolina, with headquarters at Fort Monroe. On 10 June he moved against a force under Gen. J. B. Magruder at Big Bethel (q.v.) and was defeated. While it was comparatively a small affair, like another about the same time at Vienna in front of Washington, both caused widespread dissatisfaction and mortification in the North. See also ROMNEY; NEW CREEK.

Under President Lincoln's call Ohio promptly organized 13 regiments, and 23 April Capt. George B. McClellan was appointed major-general of Ohio militia. On 14 May he was commissioned major-general in the regular army and assigned to the Department of the Ohio, embracing that State, Indiana, Illinois, and, later, West Virginia. In May the Confederate government had dispatched a small force to Grafton, W. Va., under Col. G. A. Porterfield, with the purpose of breaking the Baltimore and Ohio Railroad. On 26 May General McClellan threw troops from Ohio and Indiana into the State, defeating Porterfield at Philippi (q.v.), 3 June. West Virginia seceded from Confederate Virginia 17 June, and set up a State government which was recognized by President Lincoln on the 26th. On 9 July United States senators were elected, and on the 13th they took their seats at Washington. Congress met in special session 4 July. It legalized all President Lincoln's acts with respect to the army and navy, and authorized a further call for 500,000 men, a national loan of $250,000,000 and an increase of the navy to render effective the blockade of the Southern ports which had been declared 19 April by President Lincoln.

Following the Philippi defeat, the Confederates sent Gen. Henry A. Wise to the Kanawha Valley, and Gen. Robert S. Garnett to Beverly. Gen. William S. Rosecrans, who was commissioned brigadier-general in the regular army 16 May, joined General McClellan from Ohio, and 11 July defeated the Confederate forces under Col. John Pegram (q.v.) at Rich Mountain (q.v.). On 13 July General Garnett, during the retreat of his column, was killed at Carrick's Ford. His command escaped, leaving General McClellan in control of northwestern Virginia.

The latter part of July, upon hearing of the arrival of Gen. J. D. Cox of Ohio in the Kanawha Valley, Gen. Robert E. Lee was ordered to the command of West Virginia. The campaign for regaining the State failed, and by November the Confederate authorities decided to abandon the plan of occupying it. General Lee was ordered to the command of the Department of South Carolina, Georgia and Florida. See WEST VIRGINIA CAMPAIGN OF 1861; SCAREY CREEK; CAMP BARTOW; CAMP ALLEGHANY; CARNIFAX FERRY; GAULEY BRIDGE; ROMNEY.

Early in July the army in front of Washington under Gen. Irwin McDowell (q.v.) prepared to move against the main Confederate army under General Beauregard in front of Manassas. The flanks of each army toward the Shenandoah were protected by strong forces, Gen. Robert Patterson commanding on the Union side, and confronting Gen. Joseph E. Johnston (q.v.).

The Union advance was hastened by an almost universal cry in the North of «On to Richmond!» General McDowell left his camps on the Virginia side of the Potomac on the afternoon of 16 July with five divisions, encountering an advance brigade of Beauregard's army at Fairfax Court-House. This, with two other brigades, withdrew with light skirmishing to the main lines, which had been established behind Bull Run, its right at the crossing of the railroad from Manassas to Alexandria, and its left at the crossing of the Warrenton turnpike from Alexandria. McDowell's forces were concentrated about Centreville on the 18th, and one brigade had quite an affair on that date at Blackburn's Ford. On the 20th General Johnston arrived with all except one brigade of his army and assumed command. On the 21st McDowell, feinting in front, turned the Confederate left, and maintained a successful battle until near 4 o'clock, when the last brigade (three regiments) of Johnston's army arrived with a battery on the Union right and checked its advance. A brigade of General Beauregard's troops moving farther to the left and more directly on the Union flank, changed this check into a retreat, which soon became a panic, and the entire Union army left the field in disorderly haste. There was slight pursuit, but the panic increased, and only ended when the army was inside the fortifications of Washington. (See BULL RUN, FIRST BATTLE OF). The North was astounded at the result, and the South correspondingly elated. Both sections immediately redoubled their efforts to prepare for vigorous war. General McClellan was summoned from West Virginia and given command of the Department of the Potomac, and began to organize the troops pouring in from all parts of the North. On 20 August he took command of the Army of the Potomac, then for the first time organized under that title, and 1 November he was made commander-in-chief of the armies of the United States in place of Gen. Winfield Scott who had asked to be retired on account of failing health. In the rapid organization going forward in both sections, the South had the advantage of the services of the majority of regular officers from that section who resigned their commissions and went with their States.

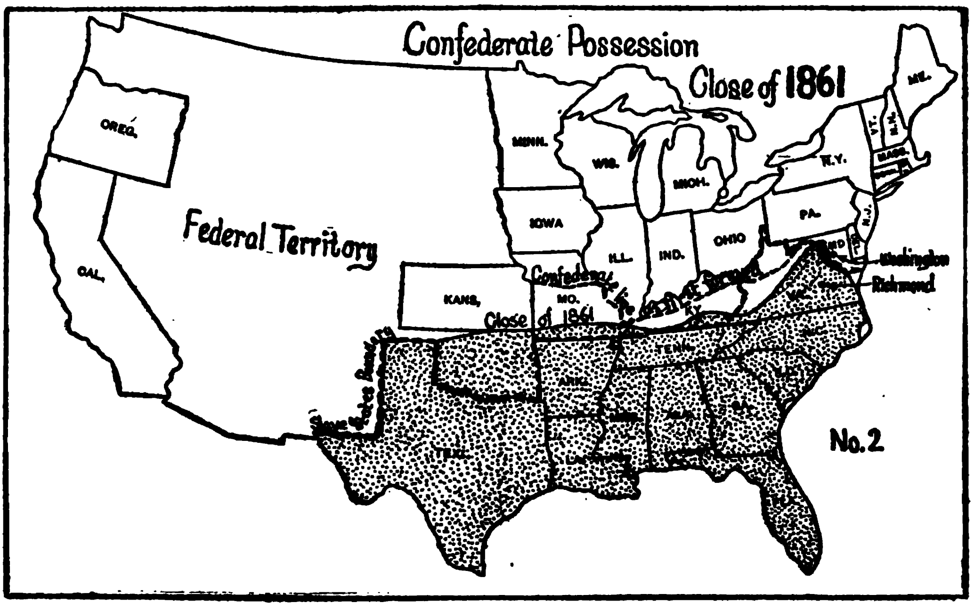
After Bull Run there was little heavy fighting during the remainder of 1861, both sides devoted their chief attention to establishing their lines. On 15 August Jefferson Davis ordered all Northern men to leave the South within 40 days; and the next day President Lincoln proclaimed the seceded States in insurrection and prohibited all intercourse. On the Union side, General Butler in command of a joint expedition of land and naval forces, sailed from Fort Monroe, and 29 August captured the forts guarding Hatteras Inlet (q.v.) opening the way to Pamlico Sound. On the lines of the Army of the Potomac the Union forces under Col. E. D. Baker, senator from California, were defeated at Ball's Bluff (q.v.), 21 October, Colonel Baker being killed. On 7 November a joint expedition from Annapolis, under Gen. Thomas West Sherman and Adm. S. F. Dupont, captured Port Royal, thus securing one of the most important harbors on the Southern coast. (See PORT ROYAL BAY; PORT ROYAL FERRY). Gen. E. O. C. Ord, with a Union brigade, defeated a brigade under J. E. B. Stuart, at Dranesville, 20 December. Gen. N. P. Banks succeeded General Patterson in the Shenandoah; General Rosecrans commanded in West Virginia. See also PENSACOLA IN THE CIVIL WAR; FORT PICKENS.

On 29 Nov. 1861, Gen. Quincy A. Gillmore was ordered to reconnoiter Fort Pulaski at the mouth of the Savannah River. On 1 December he reported that it could be reduced with batteries at 1,700 yards' distance, a third greater than foreign authorities laid down as practicable against permanent works. His batteries opened 10 April 1862, breached the walls within 24 hours and the fort surrendered 11 April.

Gen. Robert Anderson was assigned to the Department of Kentucky 28 May. His headquarters were fixed at Cincinnati on account of the position of Kentucky in regard to neutrality, but on 1 September his headquarters were moved to Louisville. On 8 October General Anderson's health failing, Gen. W. T. Sherman succeeded to the command of the Department of the Cumberland. On 9 November this Department was discontinued, and under the title of the Department of the Ohio, embracing the States of Ohio, Michigan, Indiana and most of Kentucky and Tennessee, Gen. D. C. Buell was assigned to the command, which he assumed 15 November. Gen. Ulysses S. Grant was ordered to the District of Southeastern Missouri with headquarters at Cairo, Ill., which he reached 4 September. On the 6th he seized Paducah at the mouth of the Tennessee, and 7 November was defeated in an expedition to Belmont. Gen. J. C. Frémont was ordered to Missouri, and assumed command 25 July. Before his arrival General Lyon had moved against forces under Gen. Sterling Price with which ex-Governor Jackson was seeking to regain the State (see CARTHAGE; SPRINGFIELD), and in the battle of Wilson's Creek (q.v.), 10 August, where Gen. Ben McCulloch commanded, Lyon was killed and Price occupied southern Missouri. Frémont, upon assuming command, advanced against Price, and occupied Springfield. (See also LEXINGTON, SIEGE OF). Gen. H. W. Halleck succeeded Frémont, assuming command 19 November. Gen. David Hunter then in command at Springfield withdrew under orders, leaving the Confederates in possession of southern Missouri for the rest of the year.

On the Confederate side, Gen. Joseph E. Johnston commanded the Army of Northern Virginia, "Stonewall" Jackson was in the Shenandoah, Gen. Robert E. Lee in West Virginia until November, Gen. Humphrey Marshall and Gen. G. B. Crittenden in eastern Kentucky, Gen. A. Sidney Johnston at Bowling Green, Gens. G. J. Pillow, J. B. Floyd, Simon B. Buckner and N. B. Forrest at Fort Donelson, Gen. Leonidas Polk at Columbus, Ky., and General Price in Missouri. Thus stood the opposing lines at the close of 1861. Half the year had been spent in establishing them. The campaigns of 1862 began early and were prosecuted with the greatest vigor on both sides.

From January to April Gen. H. H. Sibley, with Texas forces, was engaged in attempting to secure New Mexico to the Confederacy. He inflicted much loss on Union posts and commands under Gen. E. R. S. Canby, but abandoned his purpose the middle of April and retired to Fort Bliss. See VALVERDE.



No. 2

On 6-8 March a severe battle occurred at Pea Ridge (q.v.) or Elkhorn Tavern, Ark., between the forces of Gens. S. R. Curtis and Earl Van Dorn, resulting in the retreat of the latter.

As Gen. George H. Thomas was concentrating to attack General Crittenden at Beech Grove, Ky., opposite Mill Springs (q.v.) on the Cumberland River, the latter marched at night from his entrenchments and attacked Thomas at Logan's cross roads the morning of 19 January. The Confederates were defeated, pursued to the river and dispersed. This, with Gen. J. A. Garfield's movement up the Big Sandy, and his defeat of Humphrey Marshall at Prestonburg (q.v.), 10 January, broke the right of the Confederate line through Kentucky. On 6 February Admiral Foote's fleet, supported by Grant's forces, captured Fort Henry on the Tennessee, and Grant's army, moving at once to Fort Donelson on the Cumberland, forced its surrender on the 16th, with about 15,000 men. (See FORT HENRY AND FORT DONELSON). Gen. A. Sidney Johnston (q.v.) then evacuated Bowling Green 15 February, and Gen. Leonidas Polk withdrew from Columbus 3 March, the movements of the latter being hastened by Gen. John Pope's advance on New Madrid and Island No. 10. This latter was captured 7 April. The Confederate forces in Kentucky and Tennessee then withdrew to the line of the Memphis and Charleston Railroad, General Johnston establishing his headquarters at Corinth. General Buell, moving rapidly from Kentucky, occupied Nashville, 25 November. General Johnston, learning that Buell was to join Grant, whose army had been brought from Fort Donelson to Pittsburg Landing, and was camped there awaiting Buell, marched from Corinth to attack Grant before the junction could take place. The Union army was unexpectedly attacked 6 April at Shiloh Church, two miles and a half in front of Pittsburg Landing, and forced back to the immediate vicinity of the landing. The advance of Buell arrived about sundown, and during the night four divisions, three of Buell's army and Lew Wallace's of Grant's, reached the field. The next day the Confederates under General Beauregard, being largely outnumbered, were defeated and returned to Corinth. Gen. A. Sidney Johnston was killed near the close of the first day's fight. See SHILOH.

General Halleck arrived from Saint Louis 11 April and took command. General Pope's army was brought from Island No. 10. On 30 April an advance began on Corinth (q.v.) by slow approaches. The Confederates brought Price and Van Dorn from west of the Mississippi. On 30 May General Halleck's lines were close to the city, and an attack was meditated, when it was found that the Confederates had already evacuated the place. After a short pursuit under Pope and Buell, as far as Blackland, the Union army was concentrated at Corinth, and extensive fortifications were erected. The army was soon divided, and Buell with the Army of the Ohio was sent toward Chattanooga, with orders to repair the railroad as he advanced. Gen. Braxton Bragg, who had succeeded Beauregard, proceeding to Chattanooga by way of Mobile and moving rapidly north behind the Cumberlands, compelled Buell to withdraw to the Ohio River to protect his department, which included Indiana, Ohio and Michigan. (See MORGAN'S RAID). Gen. E. Kirby Smith, at the same time, invaded Kentucky by way of Cumberland Gap (q.v.), defeated Union forces at Richmond (q.v.), 30 August, and threatened Cincinnati. Buell, upon reaching Louisville, advanced upon Bragg. On 8 October resulted the battle of Perryville (q.v.), by which Bragg was compelled to abandon Kentucky. Passing through Cumberland Gap he retired to Chattanooga, whence he advanced to Murfreesboro in central Tennessee, and went into winter quarters. See HARTSVILLE; PARKER'S CROSS ROADS.

During the operations at Pittsburg Landing and Corinth Gen. O. M. Mitchell advanced with a division from Murfreesboro 5 April, reached Huntsville 11 April, and seized the Memphis and Charleston Railroad from Decatur to Bridgeport. Gen. J. S. Negley's brigade crossed the mountains and bombarded Chattanooga 7 June. Mitchell's operations drew Gen. E. Kirby Smith from East Tennessee, and left the way open for Gen. G. W. Morgan at Cumberland Ford, Ky., to seize Cumberland Gap.

In September Price and Van Dorn, who had previously joined Beauregard from beyond the Mississippi, moved against Grant and Rosecrans in the region of Corinth. Price was defeated by Rosecrans 19 September, at Iuka (q.v.), and Van Dorn, supported by Price, 4 October, at Corinth (q.v.). (See also HATCHIE RIVER). From this campaign Rosecrans was sent to relieve Buell in command of the Army of the Cumberland, then styled the Fourteenth corps. On 30 October General Rosecrans relieved General Buell, and concentrated his army at Nashville (q.v.). On 26 December he moved toward Murfreesboro to attack Bragg. The battle began on the last day of the year, and continued during the days of 1–2 Jan. 1863. (See STONE RIVER). General Bragg retreated the night of 3 January, eventually taking up positions at Shelbyville, Tullahoma and Wartrace. General Rosecrans occupied Murfreesboro. The respective armies remained on these lines until Rosecrans' advance in June 1863.

While Rosecrans was succeeding at Murfreesboro, there was a noted Confederate victory at Galveston (q.v.). General Magruder, with a fleet of ordinary river boats, protected with hay and cotton bales, captured the *Harriet Lane* 1 January, sunk the gunboat *Westfield* and received the surrender of the forces holding the city. The Confederate *Alabama* (q.v.), arriving shortly after, captured the gunboat *Hatteras*.

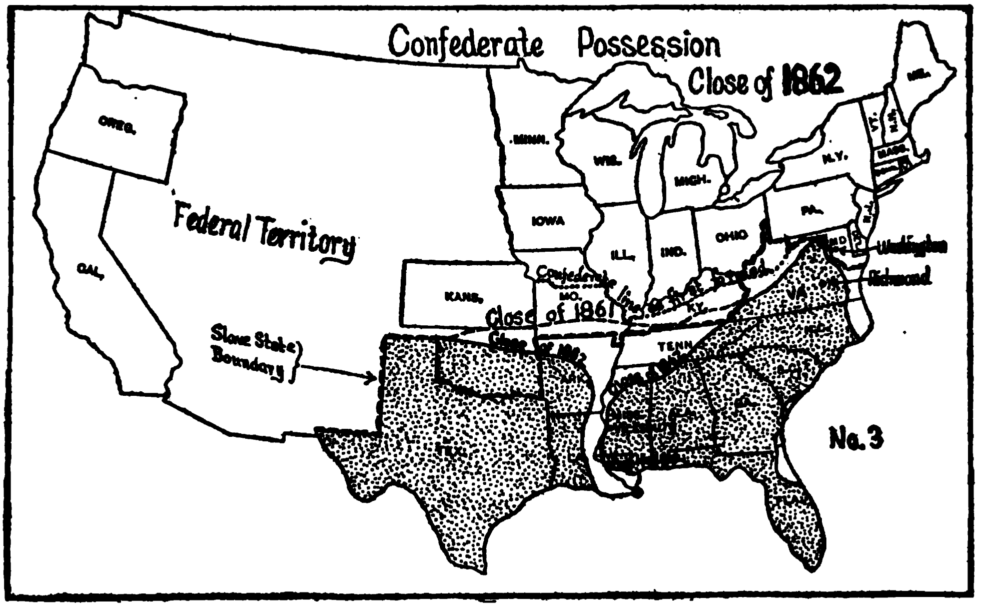
Both river fleets of armored and unarmored gunboats, mortar-boats and rams were actively engaged on the western rivers. The Union fleet, Com. A. H. Foote, was composed of 45 vessels of various classes and 38 mortar-boats. The Confederate fleet, Commodore Montgomery, was somewhat less, but contained several formidable vessels. Commodore Foote's gunboats captured Fort Henry on the Tennessee and played an important part at Fort Donelson, Pittsburg Landing and New Madrid. Commodore Montgomery awaited Foote's fleet, now under the command of Com. C. H. Davis, before Memphis. The Union fleet was made up of 5 gunboats with 68 guns and 4 rams; the Confederates of 8 gunboats with 28 guns. After a desperate battle, 6 June, against great odds, the Confederate flotilla was destroyed and Memphis surrendered to the fleet. (See also SAINT CHARLES). Davis left Memphis 29 June and 1 July reached Young's Point, where he joined Adm. David G. Farragut's fleet from New Orleans, which had run the Vicksburg batteries.

The year 1862 opened at the east with very general dissatisfaction over the long inaction of General McClellan. Gen. Joseph E. Johnston was at Manassas and Centreville with some 50,000 men, but General McClellan, misled by his secret service, continually insisted that there were three times that number. The Army of the Potomac numbered fully 150,000 present for duty. The Potomac was blockaded and the Confederate flag floated on Munson's Hill in sight of Washington. On 31 January President Lincoln gave McClellan a peremptory order to move on Manassas not later than 22 February. McClellan asked leave to present a plan of his own for a movement down the Potomac, up the Rappahannock, across to York and thence to Richmond. While he was discussing it, Johnston, placing "Quaker guns" in his embrasures at Centreville, withdrew unmolested behind the Rappahannock to a line of works and field depot already prepared.

Just as his movement began occurred the ominous attack, 8 March, of the Confederate ironclad *Merrimac*, Flag Officer Franklin Buchanan, which suddenly moved out from Norfolk and attacked the Union fleet in Hampton Roads (q.v.), sinking the frigate *Cumberland*, capturing and destroying the frigate *Congress*, doing much other damage and startling the entire Eastern coast. On resuming operations the next day the *Merrimac* was met and foiled by the *Monitor*, Lieut. John L. Worden (q.v.), which had just arrived. The *Merrimac* then retired to Norfolk, being blown up when the Confederates evacuated that city, 9 May. See MONITOR AND MERRIMAC.

McClellan was allowed to undertake his Peninsula campaign (q.v.). On 11 March he was relieved from the general command of the armies. The Army of the Potomac was transported to Fort Monroe and the movement up the peninsula toward Yorktown (q.v.) began 4 April. Heavy rains caused delays from the start. It was found at Washington that the designated number of men had not been left for the proper defense of the capital. McDowell's corps was therefore retained. Arriving before Yorktown with about three times the strength of the enemy, he concluded to lay regular siege to the position. (See LEE'S MILLS). Parallels were therefore opened, nearly 100 heavy siege guns were brought up and at the end of a month, as his batteries were about to open, Gen. J. E. Johnston evacuated the place 3 May and withdrew toward Richmond. He halted at Williamsburg (q.v.), where on the 5th an attack was made upon his lines and at night he withdrew toward Richmond. (See WEST POINT, ENGAGEMENT AT). McClellan followed to the Chickahominy. On 15 May the Union fleet in the James made an unsuccessful attack on Drewry's Bluff (See FORT DARLING), eight miles below Richmond. On

20 May the right of his army crossed the Chickahominy (see also Hanover Court House) and advanced to Seven Pines, or Fair Oaks (q.v.), about five miles from Richmond, where he was attacked by General Johnston 31 May. The prompt advance of Sumner's corps from the other side of the Chickahominy prevented serious disaster. At the close of the day General Johnston was badly wounded and carried from the field. Gen. Gustavus W. Smith commanded temporarily and was succeeded 2 June by Gen. Robert E. Lee, who continued in command of the Army of Northern Virginia until Appomattox. On 1 June the battle was renewed by the Confederates, the troops regained their lost ground and Lee withdrew to the fortifications of Richmond.



On 16 June the Union forces on James Island in Charlestown harbor, under General Benham, met with a severe repulse at Secessionville (q.v). General "Stonewall" Jackson, by a brilliant campaign in the Valley, had prevented the most of McDowell's corps, then in the vicinity of Fredericksburg, from reinforcing McClellan. (See Shenandoah Valley; Kernstown; McDowell; Front Royal; Harrisonburg). By moving rapidly down the Valley he defeated Banks at Winchester (q.v.) and forced him across the Potomac, 26 May. Returning, he defeated Gen. J. C. Frémont at Cross Keys, 8 June, on one flank and Gen. James Shields at Port Republic, 9 June, on the other, and after a week spent in deceiving General Frémont into the belief that he was about to advance down the Valley, by a rapid and unsuspected movement he appeared 25 June at Ashland on the flank of McClellan's army in front of Richmond. Then followed the Seven Days' battles, beginning with Mechanicsville 26 June and ending at Malvern Hill 2 July, whence the Army of the Potomac withdrew to Harrison's Landing on the James. (See Seven Days' Battles; Oak Grove; Mechanicsville; Gaines' Mill; Peach Orchard; Savage Station; Glendale; Malvern Hill. See also Stuart's Ride Around the Army of the Potomac). The only victories of the series were the first and last battles. The Peninsula campaign had ended as a disastrous failure. General McClellan had been relieved from the command of all the armies 11 March, retaining that of the Army of the Potomac, and Halleck assumed the chief command 23 July.

Against McClellan's protest, it was decided to withdraw his army from the Peninsula to the vicinity of Washington. To cover this movement and protect Washington, Gen. John Pope was given command of the Army of Virginia, organized with the corps of McDowell, Banks and Frémont. Pope concentrated his army north of Culpeper and began with his cavalry to operate towards Lee's railroad communications at Gordonsville. Lee, though McClellan's army was still within striking distance of Richmond, at once sent a portion of Jackson's and Gen. James Longstreet's corps to Gordonsville. Pope took the field 29 June and threatened Gordonsville again. "Stonewall" Jackson advanced on the 7th, reaching Cedar Mountain on the 9th. Here Banks attacked and was defeated. Jackson retired beyond the Rapidan, and upon Lee, with Longstreet, coming up, Pope retired behind the Rappahannock. By a long detour, by way of Salem and Thoroughfare Gap, Jackson moved rapidly around Pope's right and 26 July destroyed his stores at Bristoe Station and Manassas in his rear, retiring to the former battlefield of Bull Run. On the 23d Reynolds' division from the Army of the Potomac joined McDowell and on the 25th Gen. S. P. Heintzelman's corps, two divisions, arrived and the next day Fitz-John Porter's corps of two divisions reached Pope. The battle of Gainesville followed on the 28th, resulting in the retirement of two of McDowell's divisions. At Groveton on the 29th the head of Longstreet's forces reached the field and took part in the closing fight. All the battles of the campaign had been desperately fought by both sides. On the 30th occurred the second battle of Bull Run (q.v.). Pope was defeated, but withdrew unmolested to Centreville beyond Bull Run. Here he was joined by the strong corps of Sumner and Franklin from McClellan's army. A flank movement by Jackson led to the battle of Chantilly (q.v.). Pope then, under orders, 2 September, withdrew his army to the fortifications of Washington.

Pope was then relieved; his forces were added to the Army of the Potomac and McClellan took command of the combined army. The first Confederate invasion of the North followed. On 3 September Lee put his army in motion from Chantilly toward the Potomac. The crossing was accomplished in the vicinity of Leesburg on the 5th, the army moving forward to Frederick, where on the 7th Lee issued a proclamation setting forth that his army had come to help them regain the rights of which they had been despoiled. This was coldly received. Upon learning that the garrison of Harper's Ferry (q.v.) had not withdrawn, he detached forces which invested and captured that place with its garrison of 11,000 men and over 70 guns. (See MARYLAND HEIGHTS). Lee, who, with Longstreet's command, had marched to Hagerstown, turned back to hold Turner's Gap in South Mountain (q.v.), but was defeated on the 14th and fell back to Sharpsburg, where he was subsequently joined by the forces detached against Harper's Ferry.

McClellan advanced from Washington 5 September toward Frederick, Md., the right wing and centre passing through that place on the 13th, the right moving to Turner's and the left to Crampton's Gap. Both these positions were carried on the 14th after sharp fighting. On the 15th Lee took position on the high ground beyond Antietam Creek and in front of Sharpsburg. Gen. Joseph Hooker's corps attacked his left toward evening of the 16th, the fighting continuing until after dark. The general engagement began at daylight on the 17th, lasting for 14 hours, the losses being greater than for any one day's fighting of the war. (See ANTIETAM). The advantages were with the Union army, though Lee maintained his lines during the 18th, but at night withdrew and crossed the Potomac, ending the first invasion of the North. (See MARYLAND CAMPAIGN OF SEPTEMBER 1862). Lee remained a month about Winchester (see SHEPHERDSTOWN (BOTELER'S) FORD), and upon the Union army's crossing into Virginia and moving toward Winchester he took position behind the Rappahannock.

Near Warrenton, 7 November, McClellan was superseded by Gen. Ambrose E. Burnside, under an order dated 5 November. The latter took position opposite Fredericksburg (q.v.) 19 November, and, 13 December, forced a crossing into the city and below it. After great slaughter, largely incurred in assaults on Marye's Heights, he was repulsed and obliged to recross the river. The next month he attempted to cross above Fredericksburg and turn Lee's left. An unusual storm made advance impossible, the army finding itself actually stalled, the movement becoming known as the great Mud March. After this failure Burnside was relieved by Hooker 26 Jan. 1863.

The navy was active and effective throughout 1862. The blockade became exceedingly stringent for the Confederacy; warlike and commercial supplies alike were very difficult to obtain. On 11 January General Burnside and Com. L. M. Goldsborough sailed from Fort Monroe, capturing Roanoke Island (q.v.) 5 February, Newbern (q.v.) 14 March, and taking Fort Macon (q.v.) with its garrison 26 April. See also SOUTH MILLS.

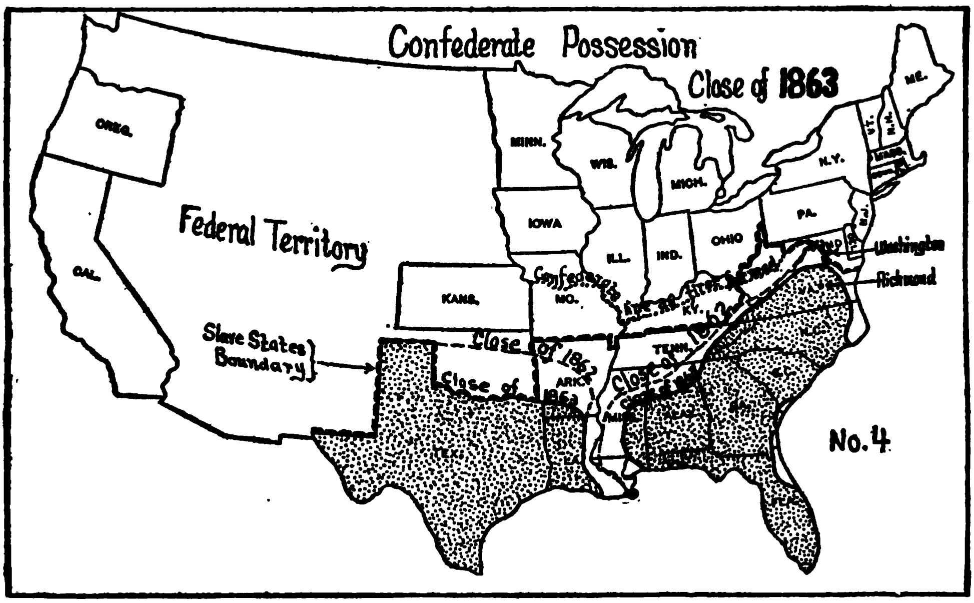
General Butler and Admiral Farragut sailed from Fort Monroe 25 February for a move against New Orleans (q.v.). After a terrific engagement, participated in by Commander D. Porter with mortar-boats, and in which the Confederates exhibited great endurance, the chain across the river below forts Saint Philip and Jackson was cut, and 24 April Farragut forced his fleet past the forts, and after terrific fighting, during which the *Varuna* was sunk by the fire of the forts, appeared before New Orleans on the 25th, General Lovell, who held the city with a small force, some 3,000, retiring. General Butler arrived with his troops 1 May, and took full possession, taking Baton Rouge 9 May, and Natchez on the 13th, neither being fortified. Farragut's fleet then ascended the Mississippi. He ran past the batteries at Vicksburg and joined Commodore Foote's (Davis') fleet from Memphis at Young's Point. Retiring to New Orleans, thus running the Vicksburg batteries a second time, he found letters from Washington urging him to clear the Mississippi. On 25 June his fleet, with Porter's mortar fleet, was assembled at Vicksburg, and on the 28th, after a short engagement, two ships and five gunboats ran the batteries and again joined Davis' fleet above the city. On 15 July the Confederate ironclad *Arkansas* came out of the Yazoo, ran directly through the Union fleet, none of its vessels having steam up, and gained the shelter of the Vicksburg batteries. Farragut ran the batteries that night, and attempted to destroy the *Arkansas* while passing the city wharves, but failed. On 20 July his fleet was ordered to New Orleans, where it arrived on the 29th.

Grant, from Corinth, 1 November, began his first move against Vicksburg (q.v.), by ordering his troops forward to Grand Junction, purposing to move along the railroad by way of Holly Springs and Grenada to the rear of the city, while Sherman should co-operate from Memphis. A raid by Forrest destroyed long reaches of railroad above Jackson, and the destruction of the depot of supplies with its immense stores at Holly Springs (q.v.) 20 December, by Van Dorn, effectually paralyzed Grant's advance toward Vicksburg.

During Forrest's and Van Dorn's operations east of the Mississippi Gen. T. C. Hindman, in Arkansas, attacked Gens. F. J. Herron and J. G. Blunt at Prairie Grove (q.v.), but retreated after a severe engagement. On 16 December Gen. N. P. Banks relieved General Butler at New Orleans.

Sherman was then sent, 20 December, from Memphis down the Mississippi to ascend the Yazoo and attempt the capture of the left flank of the defenses of the city at Haines' Bluff. He assaulted at Chickasaw Bayou (q.v.) 29 December, with disastrous results, and returned to the mouth of the Yazoo, where he was met by Gen. J. A. McClernand with orders to assume general command. This officer at once moved up the Arkansas River with Porter's gunboat fleet and Sherman's and G. W. Morgan's corps, captured Fort Hindman (q.v.) 11 January, and returned to Young's Point. From this position the Vicksburg campaign of 1863 began, which opened the Union operations of that year.

The first attempt was to cut a canal across the peninsula opposite Vicksburg, which would allow the army to move below Vicksburg. After working on this from 22 January to 7 March, a flood destroyed it. Efforts were next made to open a way through Lake Providence to the Red River, making a circuit of 350 miles to a point below the city. Both this plan and one for the east side through the Yazoo pass leading to the rear of the city, being actively opposed by the Confederates, and found otherwise exceedingly difficult, were abandoned. See Yazoo Pass and Steele's Bayou.



A way was finally found from Milliken's Bend (q.v.) by way of New Carthage to a point on the river opposite Bruinsburg. On the night of 16 April the memorable running of the Vicksburg batteries by the fleet of Admiral Porter, convoying transports, was successfully accomplished. The means of ferrying his forces over the Mississippi being thus secured, the advance of the army crossed 30 April. Port Gibson was captured 1 May, after a stubborn and most gallant defense against a greatly superior force by Generals Bowen, Baldwin and Cockrell. Grant was then on solid ground in rear of Vicksburg. See also Raymond.

He moved at once to intervene between Pemberton at Vicksburg and Johnston, who was seeking a junction with Pemberton. Johnston was forced out of Jackson by Sherman's and Gen. James B. McPherson's troops 14 May. Grant then turned toward Pemberton, advancing from Vicksburg, defeated him at Champion's Hill (q.v.) on the 16th, again at Big Black Bridge (q.v.) on the 18th, whence Pemberton withdrew into Vicksburg, followed by Grant. On the 19th Grant ordered an assault, which was repulsed, and again on the 22d, with the same result. A regular siege was then undertaken, and Pemberton's army was starved out and surrendered 4 July. See also Jackson, Siege of; Yazoo City.

On 24 May 1863, Gen. J. M. Schofield, who had been active and prominent in Missouri from the first, relieved General Curtis in command of the Department of the Missouri. During the Vicksburg campaign he sent all troops that could be spared to Grant. Upon their return he was able to advance General Steele to the line of the Arkansas and hold it thereafter. (See also Helena; Little Rock; Pine Bluff). During 8–14 June, Grant received a division from Gen. S. A. Hurlbut's command, under Gen. Sooy Smith, one from the Department of the Missouri, under General Herron, and two divisions of the Ninth corps under Gen. J. G. Parke. During the operations of General Grant about Vicksburg General Banks was active in Louisiana. After three unsuccessful attempts against Port Hudson (q.v.), which he twice assaulted, it finally surrendered 8 July, upon hearing of the capture of Vicksburg.

In January, February and March 1863, the Union ironclads under Admiral Dupont made unsuccessful attacks upon Fort McAllister (q.v.) in the Ogeechee River, but in one of them destroyed the noted blockade-runner *Nashville*. The Confederates were active on the North Carolina coast early in 1863 (see Newbern; Washington; Suffolk) and General Hoke captured Plymouth (q.v.) 20 April 1864. See also Albemarle, The.

The campaign of the year in the Army of the Potomac was opened by Hooker. (See Stoneman's Virginia Raid). On 28 April Gen. John Sedgwick's corps was thrown across the Rappahannock at Fredericksburg, the rest of his army crossing above at Kelly's ford, and thence advancing across the Rapidan at Ger-manna and Ely's fords, to and beyond Chancellorsville (q.v.). His force was fully twice that of Lee. On 1 May Hooker's advance fell back to Chancellorsville. On 2 May "Stonewall" Jackson's corps of three divisions was descried at different times during the day from several points of the Union line moving toward its right. No preparations were made to guard against a flank attack, though orders to that effect were early given. At 6 P.M., while the troops of the Eleventh corps holding the right were at supper, Jackson's solid columns burst upon them and disastrously routed the Union right. On the 3d Sedgwick's corps advanced from Fredericksburg to Salem Church, was defeated that afternoon, and recrossed the river on the night of the 4th. The night of the 2d Jackson, reconnoitering in front of his pickets, was mistakenly fired on by them and mortally wounded. On the 3d, by hot fighting, Hooker's lines were forced further to the rear. The 4th passed without an engagement, as Lee, with the greater part of his army, was at Salem Church. The night of the 5th Hooker, thoroughly defeated, recrossed the river, and his army was reassembled at Falmouth.

On 3 June, Lee, from Fredericksburg, began his second invasion of the North, Longstreet's troops leading. After minor engagements in the Valley (see Fleetwood and Brandy Station; Winchester, Second Battle of; Middleburg, Aldie and Upperville; Hanover; Martinsburg), Gen. R. S. Ewell's advance crossed the Potomac at Williamsport 15–16 June, moved forward to Chambersburg, and had reached the vicinity of Harrisburg and Columbia on the Susquehanna, and captured York 28 June, when recalled to Gettysburg, where Lee's army was concentrating. See Stuart's Raid to Chambersburg; Wrightsville.

Meantime, the Army of the Potomac under Hooker reached the vicinity of Frederick, when Hooker, not being allowed to order the garrison of Harper's Ferry, over 10,000 strong, to join him, asked to be relieved, and Gen. George G. Meade succeeded him. The two armies met at Gettysburg 1 July. A three days' battle followed. Lee retreated the night of the 3d, but succeeded in recrossing the Potomac without a battle, and after a month's rest in the Shenandoah resumed his former lines behind the Rappahannock. (See Gettysburg, Battle of). Meade followed later to that stream. (See Manassas Gap; Jeffersonton; Kelly's Ford; Rappahannock Station). With the exception of the Mine Run campaign (q.v.) 26 November to 2 December, inaugurated by General Meade, but without important results, both armies remained in their camps until the spring of 1864. See also Richmond, Kilpatrick's Expedition to.

The campaign of the Army of the Cumberland for 1863 began 23 June, the objective being the recovery of middle Tennessee. (See also Sanders' Raid into East Tennessee). The Union army under Rosecrans held the line of Stone's River, headquarters at Murfreesboro; the Confederates under General Bragg, the general line of Duck River, with headquarters at Tullahoma. By feinting against Bragg's left at Shelbyville and turning his right, both flanks being established in entrenched camps, Bragg was forced out of his lines and retreated over the Cumberlands and across the Tennessee to Chattanooga. It was chiefly a strategic campaign, carried on in continuous rains of most unusual severity, occupying nine days, and involving a total loss of only 560 killed, wounded and missing. The Union line advanced to the western base of the Cumberland Mountains. See Thompson's Station; Vaught's Hill; Streight's Raid from Tuscumbia; Morgan's Raid; Tullahoma Campaign.

The succeeding campaign, having Chattanooga for its objective, required extensive repairs to the railroad and an accumulation of supplies sufficient for leaving a base for a month, and moving in a mountainous region largely barren. The movement began 16 August. Bragg was at Chattanooga. Rosecrans' army lay along the western base of the Cumberlands from Winchester to McMinnville. Rosecrans feinted with his left corps, Gen. T. L. Crittenden's, by throwing it from McMinnville over the mountains, its advance being into the valley of the Tennessee above Chattanooga. This led to the belief that a junction was to be formed with Burnside from Knoxville, or an attack made upon the city from that quarter. Bragg, as a result, fixed his attention upon this move. Meantime the centre corps, Thomas', and the right, Gen. A. McD. McCook's, crossed the Cumberlands and the Tennessee River some 30 miles below Chattanooga, continued over the Sand Mountains, and ascended the Lookout range — all bold mountains with palisaded summits crossed only by very difficult and widely separated mountain trails. When Rosecrans' columns were ascertained to be on Lookout, Bragg, 7 and 8 September, withdrew from Chattanooga, the heads of the Union columns having in the meantime descended into McLemore's Cove, south of Chattanooga. Upon Bragg's reaching Lafayette, 26 miles south of Chattanooga, he awaited Longstreet's arrival from Virginia, meantime unsuccessfully demonstrating against Rosecrans' centre and left east of Lookout in the valley of the Chickamauga. Crittenden's corps, after having accomplished its diversion, had crossed the Tennessee, left one brigade in Chattanooga, 9 September, and moved south through Rossville to a position on Rosecrans' left at Lee and Gordon's Mill on the Chickamauga. Bragg, strengthened by Longstreet, started back 17 September toward Chattanooga, seeking to interpose between Rosecrans and that city. Rosecrans, by a night march, 18 September, proceeded toward Chattanooga, formed his lines between Bragg and the city, nine miles south of it, at Chickamauga (q.v.). A two days' battle, 19 and 20 September, ensued for the possession of the roads to Chattanooga. At noon of the second day Longstreet broke through a gap at the centre of the Union lines, cut off two divisions of the right wing, and forced them with fragments of other divisions from the field, Rosecrans, McCook and Crittenden being caught in the break. General Thomas, with the greater part of seven divisions, held the field, and at night withdrew to Rossville and there reformed the army between Bragg and the city, thus securing its possession without further fighting. Bragg advanced on the 22d, and formed his lines in front of the city, which Rosecrans soon rendered impregnable by heavy earthworks. Bragg's lines embraced Lookout

Mountain and Missionary Ridge, heights overlooking the city, the mountain position closing the river line of supplies. The situation of the Union army soon became precarious for want of food and forage. (See also PHILADELPHIA, TENN., MILITARY OPERATIONS AT). Hooker, with the Eleventh and Twelfth corps was ordered from the Army of the Potomac, reaching Bridgeport 30 September; and Sherman, with four divisions from the vicinity of Vicksburg. Grant was assigned to general command, arriving 23 October. Rosecrans was replaced by Gen. George H. Thomas 19 October. The river line of supplies was opened 28 October upon a plan devised by General Rosecrans and executed by Gen. W. F. Smith, Hooker being brought forward to Lookout Valley, and troops from Chattanooga forming a junction with him. The battle of Chattanooga (q.v.) accupied three days. On 23 November Thomas, in the centre, threw forward one division, supported by four, and captured the advanced line of Bragg. The night of the 23d Sherman crossed the river six miles above the city and seized an unoccupied range overlooking the north end of Missionary Ridge. On 24 November Hooker carried the western and northern slopes of Lookout Mountain, and the next day moved against the south end of Missionary Ridge. The afternoon of 25 November Thomas, at the centre, assaulted Missionary Ridge, his storming line being two and a half miles front, carried the earthworks at the foot of the ridge, and next the ridge itself, capturing 37 guns on the summit, and forcing a general retreat. From this time Chattanooga remained in Union control to the close of the war. See also RINGGOLD GAP.

The same day that Rosecrans started from Winchester, Tenn., for Chattanooga, Burnside with the Army of the Ohio (Twenty-third corps) left Lexington, Ky., for Knoxville, Tenn. (q.v.), his Ninth corps being still with Grant near Vicksburg. He reached Knoxville 2 September. Being ordered to assist Rosecrans at Chattanooga, he was held by demonstrations of a small force from making the junction. (See ROGERSVILLE; CAMPBELL'S STATION). On 4 November Bragg dispatched Longstreet's corps from Chattanooga to besiege Knoxville. On the 29th he assaulted Fort Saunders and was repulsed with serious loss. Sherman, who was sent by Grant from Chattanooga after the success there, now approaching, Longstreet retreated to Virginia. On 16 December Burnside was relieved and ordered to recruit the Ninth corps, which was assembled at Annapolis.

Throughout these operations both Union and Confederate forces in Charleston harbor had been engaged in formidable attack and most stubborn and brilliant defense. General Gillmore, who had reached Charleston 12 June, immediately undertook engineering and siege work of unprecedented character as to success at long ranges; and finally, after several severe repulses, forced the evacuation of Fort Wagner (q.v.) 7 September, and soon shells reached the city from his long-range guns. While some of these fell in Charleston 31 August, the regular bombardment began 16 November.

On 28 Jan. 1864, General Rosecrans was ordered to relieve Gen. John M. Schofield in Missouri, the latter being assigned a little later to the command of the Department and Army of the Ohio at Knoxville. General Rosecrans repulsed the invasion of General Price, and then sent troops not needed to General Thomas at Nashville. On 20 February an expedition sent from Charleston to Florida by General Gillmore under General Seymour was disastrously defeated by General Finegan at Olustee (q.v.). From February to December 1864, General Forrest was active throughout West Tennessee and northern Mississippi and Alabama, performing much brilliant cavalry service, to the continued disturbance of all Union commands in those regions. See FORT PILLOW; GUNTOWN; TUPELO.

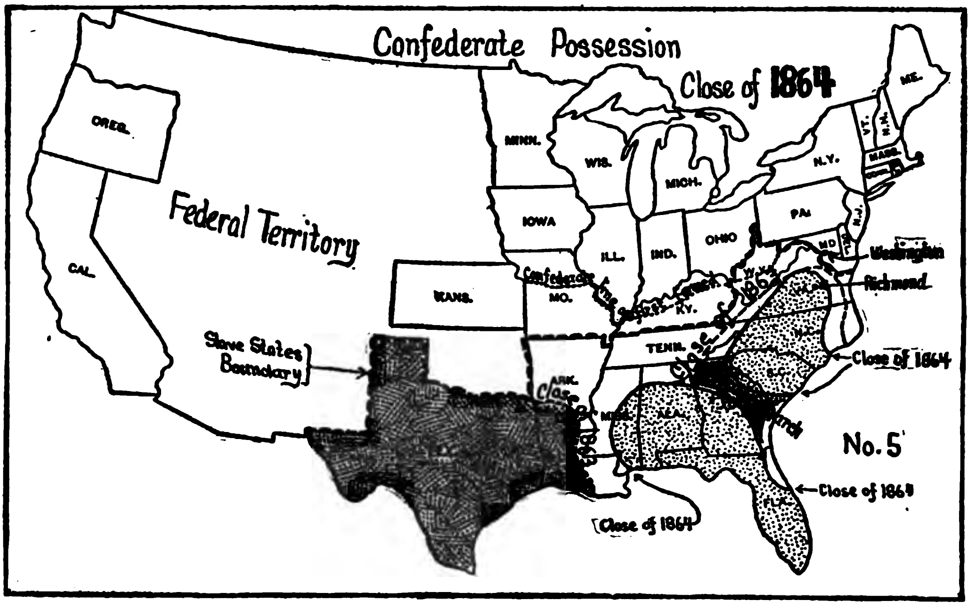
Early in the spring of 1864 Banks, supported by Admiral Porter's fleet, was ordered to advance up the Red River (q.v.). (See also SABINE PASS; STERLING'S PLANTATION). At Sabine Crossroads (q.v.) 8 April, he was defeated and driven back to Pleasant Grove, and thence to Pleasant Hill 13 April, where A. J. Smith, from Sherman's army, reinforced him. The fleet narrowly escaped capture by the falling of the river, and altogether the campaign was a decided failure. (See YELLOW BAYOU). The defeat of Banks enabled the Confederate general, J. F. Fagan, to force Gen. Frederick Steele, who was advancing to co-operate with Banks, back to Little Rock. (See MARKS' MILLS; JENKINS' FERRY; POISON SPRINGS). Banks was relieved 12 May by Gen. E. R. S. Canby.

On 12 March 1864, General Grant, who had been commissioned lieutenant-general, that grade having been revived by Congress, was placed in command of all the armies. Early in April he had formed a plan for a combined movement of the armies to begin toward the last of the month, and had communicated the same to Meade with the Army of the Potomac, Butler at Fort Monroe, Sherman at Chattanooga and Banks at New Orleans. The main Confederate armies were those of Lee, at Orange, with Longstreet at Gordonsville, confronting Meade in the vicinity of Culpeper, and Johnston at Dalton, Ga., facing Sherman in the vicinity of Chattanooga.

Grant's general plan was for Gillmore, from South Carolina, with 10,000 men, to join Butler at Fort Monroe, giving him 23,000 troops for a move up the James to capture City Point, threatening Petersburg and the rear of Richmond. (See RICHMOND, UNION CAMPAIGNS AGAINST). Burnside, with 25,000 men assembling at Annapolis, was to join Meade, and the Army of the Potomac was to advance toward Richmond by Lee's right. Sherman, with three armies, the Cumberland, under George H. Thomas, the Tennessee, under McPherson, and the Ohio, under Schofield, aggregating nearly 100,000 men, was to move against Johnston's army at Dalton and follow it. (See also MERIDIAN, EXPEDITION TO; YAZOO CITY). Banks was to leave the Red River country to Steele and the navy, abandon Texas and move against Mobile with his 25,000 men, re-inforced by 5,000 from Missouri.

Grant established his headquarters with the Army of the Potomac, Meade having the full direction of the army under Grant's general orders. The Army of the Potomac moved toward the Rapidan in the early morning of 4 May, and by night all the troops had crossed.

Grant's force was about 119,000, and Lee's about 62,000. Lee pushed rapidly to his right and struck Grant's advance in the Wilderness (q.v.) 5 May. Terrific fighting followed till the night of the 6th. (See Todd's Tavern). Lee pushed on to Spottsylvania (q.v.), reaching it in advance of Grant and interposing on the line to Richmond. Both armies entrenched, and from the 8th there was bitter fighting until the night of the 20th (see Po River), when Grant started for North Anna (q.v.). From Spottsylvania 8 May, P. H. Sheridan (q.v.), commanding Grant's cavalry, made a raid around Lee's army, encountering and defeating J. E. B. Stuart at Yellow Tavern 11 May, where Stuart was killed. Sheridan spent a day within the outer defenses of Richmond, and joined Butler on the James. (See Richmond, Sheridan's Raid on Communications with). Grant proceeded to move to his left, everywhere opposed by Lee, fighting heavily at North Anna and Bethesda Church (see also Hawes' Shop; Pamunkey and Totopotomoy), reaching Cold Harbor (q.v.) 2 June. On the 3d Grant assaulted along his whole line, to meet in an hour with terrible slaughter and repulse, so serious that an order for a second assault was not carried out. Grant had failed to interpose between Lee and Richmond. From Cold Harbor he sent Sheridan with his cavalry to occupy the attention of Fitzhugh Lee's and Hampton's (qq.v.) cavalry while he withdrew to the James. Sheridan defeated both at Trevilian Station. (See Trevilian Raid; also Saint Mary's Church). Grant then moved without interruption to the James, reaching it 13 June, and crossing it in the vicinity of City Point and Bermuda Hundred (q.v.). General Butler had occupied these points 5 May. (See also Swift Creek). On the 14th Butler carried the outer defenses of Drewry's Bluff (q.v.), but was thence driven back by Beauregard's troops, who had arrived from the south, and his contemplated movement toward Petersburg (q.v.) and the rear of Richmond was defeated. Lee occupied the Petersburg lines. Grant attacked the works several times unsuccessfully from 15 to 18 June. On 30 July an attempt on the works was made by exploding a mine. The explosion was a great success, but the assault to follow it was a failure. This was the battle of The Crater.



From the establishment of Grant's lines before Petersburg frequent and heavy fighting continued until about 1 November, but with little permanent impression on General Lee's lines. (See Jerusalem Plank Road; Deep Bottom; Globe Tavern; Reams' Station; Poplar Springs Church; Hatcher's Run [Boydton Road]; Fair Oaks — Darbytown Road). The Union left, however, was extended across the Weldon Railroad. On 28 September General Butler, with two corps, crossed to the north side of the James and captured Fort Harrison (q.v.), a position from which Richmond was seriously threatened. On 16 November Butler, supported by Porter's fleet, was sent to capture Fort Fisher (q.v.), but failed. During the winter the lines of each army were greatly strengthened. On 7 December Grant had extended his left 20 miles to Hicksford on the Weldon Railroad. On 22 June Gen. James H. Wilson, with two divisions of cavalry, moved against the railroads south of Richmond, destroying nearly 50 miles of track, and inflicting much other serious damage. His return route was blocked, but he brought his forces in with some loss of both artillery and trains. He had severed all railroad connections with Richmond, and they were not fully restored for several weeks. (See Weldon and South Side Railroads). Gen. Franz Sigel's campaign began 1 May. On the 15th he moved up the Shenandoah to New Market and was defeated, cadets from the Virginia Military Institute taking prominent part. At Grant's request Sigel was suspended and Gen. David Hunter assigned. The latter pushed on to Lynchburg (see Piedmont), but was compelled by Gen. Jubal A. Early (q.v.) to retreat from that point by way of the Kanawha and Ohio rivers to Parkersburg, and thence by rail to the east. Gen. George Crook's wing of Sigel's column from the Kanawha penetrated to the Tennessee and Virginia Railroad at Wytheville (q.v.). See also Cloyd's Mountain.

On 6 May General Sherman moved from the vicinity of Chattanooga against General Johnston at Dalton (q.v.). The Union army had in round numbers 100,000, the Confederates being about half as strong. After vainly attacking the gaps and ranges in front of Dalton for several days, Sherman passed his army through Snake Creek Gap leading to the rear of Dalton. This compelled General Johnston to retire from his camps, and he was defeated at Resaca (q.v.). Johnston resisted stubbornly at every step, but he was successively flanked out of every new position until he reached Atlanta. (See Rome; Dallas; New Hope Church; Marietta; Pine Mountain; Kolbs Farm; Kenesaw Mountain; Smyrna Camp Ground). Fighting had been in progress at some points of the line from May till September. Johnston was succeeded by Hood 18 July, and on the 20th Hood attacked at Peach Tree Creek (q.v.) and was repulsed with great loss. He then moved out of Atlanta and attacked, and was again defeated. (See Leggett's or Bald Hill). General McPherson, commanding the Army of the Tennessee, was killed. The next attack was at Ezra Church (q.v.) 28 July, upon the Army of the Tennessee, this also being repulsed after three hours' severe fighting, with much loss. See also Stoneman's Macon Raid.

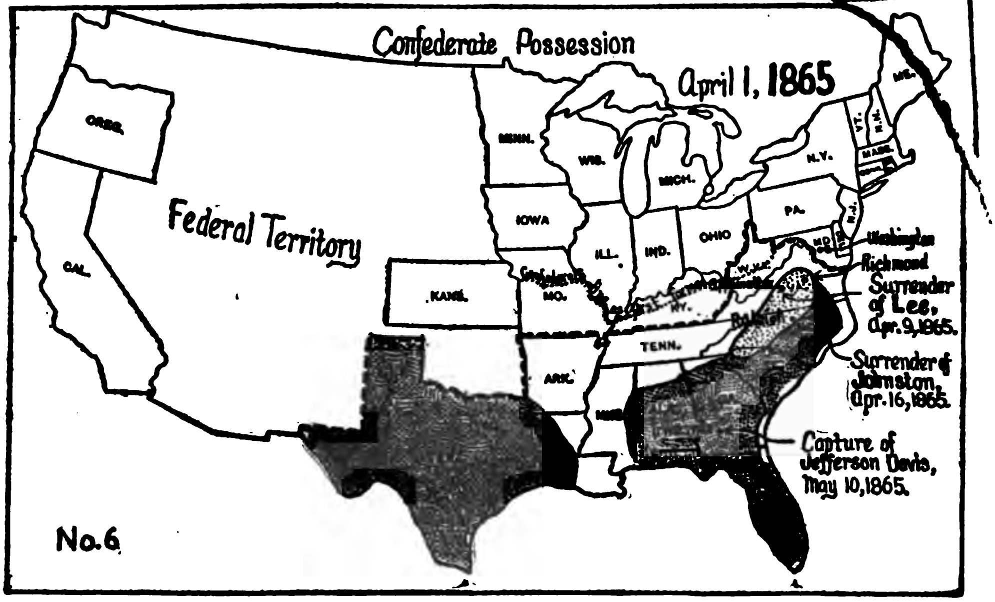
On 2 September Sherman occupied Atlanta, which was evacuated as a result of his moving to the rear of the city on Jonesboro (q.v.). Hood first raided Sherman's railroad communications, fighting heavily at Allatoona 5 October, and soon after moved northward. General Thomas was sent to resist his movement if he invaded Tennessee, and Sherman started 15 November on his March to the Sea (q.v. See also Griswoldville). While it was originally intended by General Grant that he should move from Atlanta to Mobile, the harbor there having been captured 5–23 August by Farragut and Canby, he decided upon the alternative which Grant had suggested before the campaign opened, and started for Savannah.

The fight of Farragut's fleet in the harbor of Mobile, which decided Sherman's march to Savannah, was one of the most brilliant in naval warfare. (See Fort Gains and Fort Morgan; Mobile Bay; Fort Blakely). The Confederate fleet was destroyed, including the far-famed ironclad ram *Tennessee*. Sherman reached Savannah with slight opposition. (See Fort McAllister; also Honey Hill). On 17 December he summoned Hardee to surrender. The latter refused, and on the night of the 20th retired with his force of 10,000 without molestation. The next morning the Union army entered.

Meantime Hood had invaded Tennessee with the entire army with which Sherman's three armies had been confronted from March till September. General Thomas left with two small but excellent corps, by great exertion organized an army to oppose Hood. (See Spring Hill). On 30 November General Schofield, commanding in the field in front of Hood, inflicted a nearly fatal blow upon him at Franklin (q.v.). After General Thomas' forces were united at Nashville (q.v.) 15–16 December, he attacked Hood's entrenchments in front of the city and dispersed and practically annihilated his army. See also Russellville; Stoneman's Raid from East Tennessee; Saltville.

The forced retreat of Hunter from Lynchburg over the mountains of West Virginia left the Shenandoah unprotected. General Early entered it, drove Sigel across the Potomac (see Martinsburg; Maryland Heights), then on 9 July defeated Wallace, who was in small force at Monocacy, Md. (q.v.), threatened Baltimore and appeared before Washington 11 July. Here he was met by veterans of the Sixth and Nineteenth corps, Army of the Potomac, hurried to Washington by Grant, and forced into rapid retreat. (See Washington, Early's Attempt on; Snicker's Ferry and Berry's Ferry; Stephenson's Depot; Shepherdstown; Kernstown, Second Battle of). Upon the withdrawal of the troops from the Army of the Potomac Early again sent a force under Gen. John McCausland, into Pennsylvania, and these invaders burned Chambersburg 30 July. (See McCausland's Raid). Sheridan, being assigned to command, forced Early beyond Staunton; and devastating the Valley, he withdrew to Cedar Creek. While Sheridan was absent Early attacked and drove the army out of its camps. Gen. H. G. Wright, however, rallied the troops near Middletown and restored the battle. Sheridan arriving, the army advanced, and Early was so seriously defeated as to close the campaign in the Valley. See Shepherdstown; Smithfield; Opequon; Fisher's Hill; Cedar Creek; Milford; Nineveh.

The first movement of the final campaigns of 1865 began 2 January in Tennessee, when General Schofield with the Twenty-third corps left Columbia, Tenn., for Clifton on the river bound for the east. The corps left Alexandria on transports soon after 1 February, and landed at the mouth of Cape Fear River, 9 February, where the Tenth corps was established, which, under Gen. Alfred H. Terry, had captured Fort Fisher (q.v.) that had been most stubbornly and gallantly defended against the army and the fleet by Gen. W. H. C. Whiting. Fort Anderson was attacked by army and fleet, and abandoned 19 February; the position of Town Creek was carried 20 February, and Wilmington (q.v.) was taken 22 February. Operating next by way of Newbern, Gen. R. F. Hoke was defeated at Kinston (q.v.) 10 March. Goldsboro (q.v.) was occupied by General Schofield on the 21st. Sherman's army joined Schofield here on the 23d. On 26 January General Terry had been dispatched to co-operate with Admiral Porter in reducing Fort Fisher at the mouth of Cape Fear River. A previous expedition under General Butler, 13–16 December, had failed, but the fleet had remained, and Porter had appealed to Grant to send another force. Terry's troops effected a landing above the fort 13 January. The next morning he was entrenched across the peninsula. Early on the 15th the fleet opened a terrific bombardment, which was continued until a force of marines was landed in the afternoon to co-operate in the assault of the army. This was delivered at 3.30 in the afternoon, the flank of the work next the river being carried. Then followed severe fighting for each succeeding traverse. It was not until 10 o'clock at night that the fort was finally carried. Sherman started northward from Savannah 1 February (see Savannah to Goldsboro). Marching through swamps, and crossing all streams at flood, he was before Columbia on the 16th. It was surrendered without fighting the next day. Charleston, being cut off from interior communications, was evacuated by Gen. W. J. Hardee 18 February. Fayetteville, N. C., was reached 11 March. The first opposition stronger than skirmishing was at Averasboro 16 March, where General Hardee made a brief stand. On 19 March Johnston's army, which had been collected on Sherman's front at Bentonville (q.v.), checked his advance and nearly overwhelmed his left wing before the right wing, which was widely separated from the left, could reach it. On the 21st Johnston was defeated after sharp fighting, and Sherman marched for Goldsboro, which he reached 23 March. See also Stoneman's Raid in East Tennessee, Southwestern Virginia and Western North Carolina.



No. 6

On 2 March Sheridan advanced up the Valley, defeated Early at Waynesboro (q.v.) and proceeded through Charlottesville and along the Richmond and L. Railroad, destroying roads and stores, and joined Grant at Petersburg. Gen. James H. Wilson, operating under Gen. George H. Thomas, crossed the Tennessee 22 March with a thoroughly equipped mounted force of 12,500, and 1,500 dismounted, to follow, until horses could be captured. (See Wilson's Raid from Chickasaw to Selma and Macon). His first objective was Selma, Ala. A portion of Forrest's cavalry was encountered and defeated at Montevallo 30 March. The fortifications of Selma (q.v.) were carried against Forrest 2 April, and immense war supplies and plants for the manufacture of war materials destroyed. Montgomery surrendered 12 April; West Point was captured 15 April, after sharp fighting; Columbus was carried by a night assault 16 April; Macon surrendered 20 April. Here Wilson received notice of the Sherman-Johnston truce. An expedition, sent out 7 May by Wilson from Macon, under Colonel Pritchard, Fourth Michigan, captured Jefferson Davis, 10 May, at Irwinsville, Ga. On 6 February the Confederates made a heavy attack at Hatcher's Run on Grant's left, but were finally repulsed with a Union loss of about 1,500. (See Hatcher's Run [Dabney's Mill and Armstrong's Mill] Battle of). The night of 24 March Gen. J. B. Gordon made a daring and most successful assault upon the right of Grant's lines at Petersburg, capturing Fort Stedman (q.v.) and three strong works. These were recaptured the next day.

The Army of the Potomac was the last to move in the opening campaigns of 1865. It had occupied its lines before Petersburg without general movement from November till the last of March. The general movement, which was to the left, began on the 29th, and brought on the battle of Dinwiddie Court House (q.v.) and White Oak Road on the 31st, and the battle of Five Forks (q.v.) on 1 April, in which latter engagement the Confederates were defeated. On 2 April the Confederate entrenchments were carried, and General Lee abandoned his lines during the night, having notified President Davis during the forenoon that he would begin a retreat on Amelia Court House that night. Jefferson Davis received this dispatch in church. He and his Cabinet immediately collected personal effects and Confederate archives, and left Richmond on a special train. Gen. Godfrey Weitzel received the surrender of the city on 3 April.

General Lee's army was assembled at Amelia Court House 5 April, and continued its retreat at night. On the 6th General Meade advanced on Amelia Court House, but, finding that General Lee had left, he moved toward Deatonsville (Sailor's Creek), where the most of Ewell's corps, the rear of Lee's army, was captured 6 April. (See SAILOR'S CREEK). About the same time some 10,000 men of the divisions of Anderson, Pickett and Bushrod Johnson (qq.v.), were captured. Lee continued his retreat and reached Farmville on the morning of the 7th. Here his troops received their first rations since the retreat began. At 11 o'clock, Union troops appearing, the march was renewed, his men being greatly exhausted with loss of sleep, hunger and hard marching. On this day the correspondence began between Generals Grant and Lee, which, on the 9th, resulted in the surrender of Lee's remaining forces at Appomattox. The number paroled was 28,231 officers and men, extra duty men and detailed men of every description, this remnant being all that was left within the control of General Lee of his magnificent fighting machine, the Army of Northern Virginia. See FARMVILLE AND HIGH BRIDGE.

In North Carolina Sherman and Schofield moved against Johnston, occupying Raleigh 13 April. On the 14th Johnston asked for a conference, and on the 18th terms of surrender were agreed upon, subject to the approval of the President of the United States. These, being deemed in part political, were disapproved, and General Grant was sent to Raleigh to insist upon the same terms made with Lee. These General Sherman demanded of and received from General Johnston 26 April, and the war was over, though small independent forces were in the field for a short time thereafter, Gen. Dick Taylor in Alabama not surrendering to General Canby till 4 May. The last engagement of the war occurred at Palmetto Ranch, Tex. (q.v.).

President Lincoln made nine calls for troops during the war. Under these about 2,800,000 men of all classes were enlisted, including emergency men of a few weeks, three, six and nine months' men, two and three years' men, conscripts and substitutes. There were 52,000 drafted men held to service; 75,000 conscripts who sent substitutes; and 42,000 men who sent substitutes, although not themselves drafted.

The Confederate records are very deficient, having been largely destroyed. The best estimate from the data in the possession of the War Department places the Confederate strength at something over 600,000. After Mr. Davis' calls of the first year a general conscription act was passed 16 April 1862, including all white men between the ages of 18 and 35 for the term of three years. On 27 Sept. 1862, this act was extended to include those of 45 years. On 17 Feb. 1864, the law was extended to those between 17 and 50, the term to be for the war.

According to the latest compilation of the record and pension office of the War Department, the total number of deaths from all causes in the Union army during the war was 359,528. As many records are incomplete, the actual number must be somewhat larger. On the basis of the figures given there were killed in action, 67,058; died of wounds received in action, 43,012; died of disease, 224,586. The Confederate losses were quite as severe in proportion to strength, but the records are wanting to such an extent as to make definite estimates of little value. The most complete records show that 74,524 Confederates were killed or died of wounds and that 59,927 died of disease. These returns are very incomplete and nearly all the Alabama rolls are missing.

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H. V. Boynton.
Revised by Irving E. Rines.

CIVILIAN, in common speech a word denoting a person whose employments are wholly of a civil character as distinguished from one who belongs to the army or navy, while in legal acceptation it designates one who is learned in civil or Roman law.

CIVILIS, Julius, Germanic leader of the Batavi in their revolt against the Romans, 69–70 A.D. At one time he held a command in the Roman army, but being more than once charged with treason: he escaped and roused the Batavians, his countrymen, to rebellion. Pretending to espouse the cause of Vespasian against Vitellius, he raised a powerful army and inflicted severe defeats on the Romans. He routed an imposing force sent against him and shut them up in the military station, Vetera Castra, which after a long siege capitulated and all its defenders were slaughtered. Fortune at last forsook him, and he had to negotiate with the Romans, the Batavians returning to their allegiance. His fate is unknown.

CIVILIZATION, History of. Pre-Christian. A sketch of the intellectual and material achievements of humankind in ancient times; of those productions of man's mind and skill, which have had a special influence upon the thought and life of the world. It is not assumed that civilization is or can be measured by material achievements, but without these accomplishments civilization would be impossible. With approximate dates assigned by scientists, here in brief and simple form are presented the various elements and tools by which humankind has progressed toward civilized life.

Food-Getting, Hunting and Fishing.— The first signs of man's development into a creature of more than animal intelligence and character appear in the roughly shaped Eolith flints, found in various parts of Asia and Europe, notably in France, Belgium and southern England, which are assigned to a date, ranging *c.* B.C. 500000 to B.C. 100000. During these early periods man hunted with the throwing-stone, or with the crudely pointed flint held in the hand. After B.C. 100000 all uncertainty about man as a tool-user and tool-maker disappears.

Among the remains of the Acheulean Age, *c.* B.C. 75000 to B.C. 50000, so named from discoveries at Saint Acheul on the Somme, lance-pointed flints have been found; also small points seemingly designed to serve as darts or spear-heads, and in the Gorge d'Enfer were discovered points of reindeer antler, «with split base perhaps to receive the shaft,» indicating that man was hunting with greater skill and intelligence. By about B.C. 25000 he was probably fitting shafts of bone or wood to flint points and flinging them at his victims with a «dart-thrower,» his first really successful attempt to strike a crippling or deadly blow from a distance. Skill and intelligence were slowly supplanting brute force. On the walls of the cavern of Niaux an artist of early Magdalenian times, *c.* B.C. 16000, has pictured a large bison with spears and arrows showing on the flanks, and in the Perigord cave was found the vertebra of a young reindeer with an arrow point embedded in it. While there is good reason to suspect the Cro-Magnon race was familiar with the bow and arrow it is not until neolithic times that its use is established beyond question. With this weapon in his hand man was no longer under the necessity of defending himself and hunting his food in close hand to hand combat and striving as had been the way of all animals. It gave him an entirely new dominance over his world and lifted his food-getting enterprises and himself above the level of the brute as no other invention had done up to that time. This in increasingly improved form remained man's most effective weapon until the invention of the gun.

The invention of the harpoon, *c.* B.C. 16000, is perhaps the oldest device for catching fish. «This invention,» says Mr. Osborn, «was destined to exert a very strong influence on the habits of the people. . . . This new means of obtaining an abundant food supply probably diverted the Cro-Magnons in part from the ardent and more dangerous pursuit of the larger kinds of game.» Some 10,000 years later man invented the net which in some form he used for catching fish, thus refining still further his food-getting methods. With the introduction of metals the hook was added to man's fishing-tackle.

Agriculture.— When man ceased to live on what Nature provided without effort on his part, and attempted to produce his own food supply, he wrought a mighty revolution in his habits and character. He had to stay in a place long enough to plant and to reap and this acquired a sense of ownership.

The first hints of agriculture are met with in the rough axe-like flints presumably employed «for breaking clods, hoeing the ground and other simple agricultural operations,» and finely wrought flint knives, curved somewhat at the point and likely used as sickles. The earliest sickles used in the Euphrates Valley, before B.C. 5000, were wooden models of a sheep's lower jaw set with flint points as a cutting edge. With the introduction of the plow, *c.* B.C. 5000, at first nothing better than a two-handled hoe and called «the scratching wood,» drawn by a human being and later by oxen, agriculture became a definite part of life and made possible large and well organized communities. Even more important in the progress of civilization was the increased fertility of the soil and the extension of crop-growing in spots naturally unfavorable, wrought by the invention of schemes of irrigation. Ur-Nina, *c.* B.C. 3000, is among the first recorded as building irrigating canals who thus by increasing the fruitfulness of the Babylonian fields made possible the growth and prosperity of the great Euphratean cities and the consequent human development.

Domestication of Animals.— The domestication of animals changed man's attitude toward the animal world and put a power other than his own at his service. About B.C. 10000, from evidences found at Oban in northwestern Scotland, the dog was the companion of man. At about the same time man domesticated to some extent the plateau horse and the forest horse and two varieties of cattle, the Celtic Shorthorn and the Longhorn. From Babylonian records we learn that prior to B.C. 3000, oxen were used in agricultural operations and donkeys pulled wheeled carts and chariots.

Fire.— Without the use of fire, man could not have risen above the lowest depths of savagery and barbarism. Something of its importance may be judged from the fact that it early became an object of worship. To keep it burning was a religious duty and the fashioning of metals at the earliest forges was regarded as more than a human occupation.

The earliest evidences of the use of fire thus far discovered date *c.* B.C. 60000 and consist of «charred wood and bones frequently found in the industrial deposits of early Acheulean times.» Osborn intimates that about B.C. 50000 the Neanderthal men first made real use of fire by employing it as a weapon to drive the bears from the caves in the Neander valley.

In the grotto of La Mouthe a stone lamp, *c.* B.C. 16000, has been unearthed. This lamp, not unlike some used in Dordogne at the present day, is a piece of sandstone wrought into the shape of a shallow bowl, into which was placed, according to Berthelot, animal fat and a wick. About B.C. 10000 the flint miners of Norfolk had lamps of chalk with a much deeper bowl to carry a greater supply of fat, most likely that they might labor for a longer time in their underground workings. These lamps represent man's first attempt to put fire to domestic and industrial use. The life of man was profoundly affected by discovery of ways and means to cook his food. It meant better food and better health. When he took the fire and put it on a crude stone hearth just within the hut, it meant a better home and the gathering about the hearth marks the beginning of the family circle with all that that has meant.

It was another step out of savagery when man with the aid of fire felled trees and hollowed logs to serve as boats. Much more momentous for civilization was the day when he discovered that copper and iron could be smelted from the rocks, and that these metals could be fashioned into very useful tools. Just when or where this happened there is no telling, but it would seem that the people in the Nile and Euphrates valleys had made this discovery and were using metals before or by B.C. 3500. Bronze came into use in Egypt as early as 3700 and there are indications of the use of iron as early as B.C. 3300.

Not less important for the upward progress of man was the invention by which he was able to make fire at any time and place he chose. It is believed that certain flint «fabricators» belonging to the period B.C. 7000 «were used in conjunction with nodules of iron pyrites for producing fire,» the oldest «flint and steel.»

Mining.— «Picks» made of flint and «the antlers of the red deer» found in the Thames Valley and elsewhere point to an organized mining industry for obtaining flint, needed for toolmaking as early as B.C. 10000. One specimen of the picks made from deer antlers still retains «the impression of a miner's thumb on the chalky clay which adheres to the surface.» There had been no change in the character of mining tools when man began to mine for copper, iron, tin, silver and gold, *c.* B.C. 4000. That he should be patient and persistent enough to wrest these metals from the earth with such difficulty bears witness to his determination to live more effectively.

Metal-Working.— The discovery of metal, and that it could be wrought to any desired shape, put into human hands resources by which man speedily lifted himself above the level of the Stone Age. Tools and weapons of metal enormously increased man's skill and speed as a worker. Metal-working enabled human ingenuity to manifest itself in many far-reaching inventions and improvements. To indicate all that it meant to man in his struggle to get out of the slough of savagery and barbarism, in which he had floundered for so many thousands of years, is impossible within the limits of this article. A hint may suffice. A hollowed tree trunk or a bitumen-lined rush contraption would have been the limit of water navigation had the art of metal-working not been discovered. House building and city building would have been practically impossible nor would there have been carts and chariots.

Textiles.— The growing of flax, first met with *c.* B.C. 7000, and the spinning-whorls, discs of pottery or stone used as balance wheels on primitive spindles, are good enough evidence that by this time man had invented the art of weaving. The first woven stuff must in the nature of things have been very coarse, but among predynastic Egyptians, earlier than B.C. 5000, weaving of a remarkably fine order, impossible without a loom it would seem, was already an accomplished fact. In China the silk industry attained a high degree of perfection B.C. 2500. It is recorded that B.C. 700 cotton was grown in the gardens of Sennacherib, that the people gathered and «carded it for garments.» When man learned to weave «fine linen» for the covering of his nakedness he felt a new dignity and received an added impulse toward a conscious superiority.

Building and Architecture.— The first step toward housing himself was taken when the Neanderthal man drove the wild beasts out of the caves and took possession for himself. Probably man never really *lived* in the cave. From «schematic drawings in lines and dots» on the walls of the cavern of Font-de-Gaume it is assumed that *c.* B.C. 30000 to B.C. 25000 «huts and shelters built of logs and covered with hides» were grouped around «or within the entrances of the grottos and caverns.» As late as the Danish Middens, *c.* B.C. 9000 and the lake-dwellers, the huts without chimneys and with walls of wattle and daub were sorry enough places. The invention, in the Euphrates Valley before B.C. 6000, of the brick, a piece of clay, sun-dried and later (about B.C. 5000 burnt, easily handled, was epoch-making. Cut-stone, used where clay is scarce, is brick only of larger size. This seemingly simple invention revolutionized man's whole mode of living. It no longer became necessary to rebuild after every storm or season. The durability of building material encouraged him to take a greater pride in the appearance and conditions of the home. It gave to the home a new and richer meaning.

There had always been a community life. Groups of huts resembling villages were built by the lake-dwellers and long before. Better houses, impressive temples and palaces inspired men to live a better sort of community life. Old manners and customs underwent a refinement that made them almost new. New political orders appeared. The cities and towns of increasing pretentiousness which sprang up in Egypt and Babylonia and elsewhere, the direct product of the invention of brick and the use of stone for building, became the cradle of real civilization.

The architect is largely responsible for the great strides toward civilization made between B.C. 4000 and B.C. 3000. The engineering, architectural and artistic skill lavished upon temples and tombs and public buildings during this period and the centuries immediately following gave to mankind a new scale of values. The architect represents a great passion to improve life and living conditions. The invention of the arch, before B.C. 3000, besides making lighter buildings pointed the way to the bridging of streams, making road building possible. The use of heavy blocks of stone taught men how to work together as a unit, giving rise to a new sense of human solidarity.

Art.— The birth of the artistic sense added another powerful influence to the process of civilization. As early as *c.* B.C. 25000 interesting examples of art are met with — crude line drawings on reindeer horn, human statuettes sculptured in ivory and soapstone, like those found in the Grottes de Grimaldi. The men of Aurignacian and Magdalenian times covered the walls of the caves with black and colored line drawings and pictures done elaborately in colors. The earliest instance of the use of color is perhaps the crude outline of a mammoth in red ochre on the wall of the cavern of Pindal, and what seems to be the finest example is the picture of a bison on the ceiling of the cave of Altamira *c.* B.C. 16000. Whether this art arose out of man's desire to beautify the caves where he and his fellows congregated, or whether it had something of a religious or magical origin and purpose, or whether it was the desire of man to describe and record what he saw, there is perhaps no knowing. This prehistoric art would indicate that man was feeling his way toward something other than a purely material and selfish interest in life. The impressive bas-reliefs descriptive of military exploits, industrial activities, religious and domestic relations which with increasing beauty adorn the cities of the Euphrates from B.C. 6000 and on, must have widened man's conception of things, enlarged his thoughts and deepened his interest in human affairs. The wonderful sculpture which filled the Grecian world before and after B.C. 500 must have done much to awaken in the people a love of the beautiful and a distaste for whatsoever was ugly. Perhaps most important of all, this artistic impulse cradled the written word.

Music.— Without art in its broadest sense man's divergence from the animal would have been less pronounced. In his contemplation of actual and possible beauty man is led to hate whatsoever is low and mean. Music helps to lift man to this level of higher appreciation and refinement of the feelings.

If a whistle may be classified as a musical instrument then music may be said to date from *c.* B.C. 20000. Whistles of that period which still give forth some sound, made from the phalanges of the reindeer, have been found in the caves of Perigord and elsewhere. M. Joly says that there have been found in the caves of the Pyrenees, of the same period, tubes made of the bones of birds, which may have formed part of a flute like that which tradition ascribes to the god Pan. On a terra-cotta plaque, found in the lower strata at Nippur, *c.* B.C. 4000, is pictured a shepherd playing a lute. A rock-cut sculpture found at Tel-lo, *c.* B.C. 3000, shows men with cymbals and pipes and one playing a harp of very primitive construction, and is suggestive of Egypt rather than Babylonia. What part this primitive music played in the life of the ancient peoples it is hardly possible to guess. At a quite early time it was used to celebrate notable events and entertain kings and princes. It also became an important part of religious ritual. In Greece, in the age of the Tyrants, music became a dominant feature, greatly influencing its literature and national and community life. It was one of the chief cultural agencies and gave rise to institutions which have all through the centuries since played no small part in awakening and directing and shaping the thoughts and emotions of the people. The festival chorus, *c.* B.C. 500, so important in Grecian life, developed into the drama and the place where the chorus, dressed in goat skins and faces covered with masks, sang the song-stories became the theatre.

Domestic and Social.—For many thousands of years after his beginning man ate like the animal, and had no speech. Back of B.C. 25000 he attempted to cover his nakedness with the pelts of animals. Whatever its immediate effect it led straight to a civilizing interest in appearances and the welfare of the body. With the invention of the needle, *c.* B.C. 25000, and its notable improvement, *c.* B.C. 16000, the clothing of the body not only became a habit but something of an art. Even though it originated, as some insist, as a sexual device, it became a mark of civilization. Fine clothes seemed to call forth finer manners. Personal adornment, other than clothing, such as the wearing of necklaces, *c.* B.C. 20000, as well as earrings, armlets and girdles may have originated in a desire to attract attention, or for religious or magical purposes, or as insignia of rank and accomplishment, but it led to a pride of person which must have urged the people ever further from animal-like habits. The shaving of the face and the cutting of the hair before B.C. 4000 in Egypt is evidence of a desire in man to fashion his life after his own ideas.

With the invention, *c.* B.C. 9000, of a vessel that would hold water and allow of heating the water either by putting in hot stones or placing the vessel over the fire it became for the first time possible for man to cook his food and, in the matter of food and eating, marks his definite departure from savagery. Cooked food meant a more varied and healthful diet. It moved him to think of *how* he should eat. Before B.C. 4500 man was eating a very coarse bread made of crushed wheat and barley and millet.

The use of the horns of cattle, as in two bas-reliefs beneath the overhanging cliff of Laussel, *c.* B.C. 20000, and cocoanut shells and other natural products as domestic utensils helped further to humanize the method of eating and drinking. Other and more practical utensils were fashioned soon as ever man learned the art of fashioning and hardening clay into pottery. The invention of the potter's wheel, *c.* B.C. 3500, and the kiln for firing, added greatly to the beauty and usefulness of design, and by increasing the output the refining influence of pottery upon the methods of eating food was more widespread and effective. The importance of table manners is recognized and insisted on in the sayings of Ptah-hotep, *c.* B.C. 3200.

With the rise of the art of wood- and metal-working, the homes of the wealthier class, and eventually of the poorer, were furnished with stools and chairs and couches and bedsteads (after B.C. 3000). By thus adding to the comfort of the home it became a more desirable place and naturally exerted an increasing influence upon the habits and character of the people.

No single fact has been more influential in the process of civilization than the rise of the family. Respect, consideration for one another, chastity, obedience, honor, sacrificing love, virtues altogether fundamental to civilization, are its direct product. Judging from the precepts of Ptah-hotep, *c.* B.C. 3200, care and consideration for one another was the proper thing between man and wife. In Babylonia the importance of the family is recognized in the laws regulating marriage, divorce, rights of wives and children, *c.* B.C. 2700. The precepts of Khensu-hotep, B.C. 1500, counsel children not to forget the mother-love bestowed upon them, and in the Hebrew Decalogue somewhat later it is a religious obligation for children to honor father and mother. This creates an increasing interest on the part of the parents in the bringing up of the children. The author of the Hebrew Proverbs urges parents to «train up the child in the way he should go.» Thus each new generation becomes trained a little more thoroughly in the ways of civilization.

Government.— Forms of government do not imply civilization, yet without government there could not well be any departure from the savage state. Belonging to early Aurignacian times, B.C. 25000, and particularly in the later Magdalenian period, B.C. 12000, many horn implements have been discovered, conspicuous among them being the somewhat mysterious *bâtons de commandment* formed of an antler with one or more circular holes, supposed to have been, as Mr. Osborn says, «insignia of authority borne by the chieftain» of possible primitive tribal organizations. It is pretty certain, according to Mr. Budge, that as far back as *c.* B.C. 8000 the Sumerians or their immediate ancestors were politically organized with a king at the head of things. These primitive efforts at law and order forced our wilder ancestors to hold themselves in check, to be less wild, to think before they acted. The earliest hint that men were beginning to adjust their disputes by presenting them to another for judgment is *c.* B.C. 4000, though no doubt the custom was older. Urukagina, ruler of Lagash, *c.* B.C. 2700, is among the earliest known law-makers; the most noted is Hammurabi, *c.* B.C. 2200. These laws are attempts to compel a certain orderliness, and decency and honor in human activities and relationships. This growing custom of making a man face the wrong of his acts and inflicting a penalty therefor, compelled him to see the need of taking some thought as to the character and consequences of his deeds. Here and there a man, long before Hammurabi, made notable efforts to give a more civilized character to human relationships. The districts of Lagash and Umma were ready to fly at each other's throats over a boundary dispute whereupon Mesilim, king of Kish, *c.* B.C. 3000, intervened and the trouble was arbitrated. The introduction of slavery, whatever its later evils and the inhumanity of its beginnings, helped to transform man from the wanderer and loafer into a worker.

Before man can reach up to any worthy degree of civilization there must be justice and humanity as well as order and industry in human affairs. These important elements enter definitely into life with the Hebrew legislation of *c.* B.C. 800. Some 50 years later in Greece Hesiod, a farmer poet, raised a cry for social justice. In Palestine this cry grew into a religion in the time of Josiah; in Greece it resulted in the constitutional reforms of Solon, *c.* B.C. 590, and later in democratic institutions, and the rise of the spirit of democracy. In the time of Herodotus and Pericles, B.C. 450, the people of Greece took active part in political affairs. At the same period a further step forward in civilization was taken when the people of Rome demanded the right to share in the making of new laws. Socrates, *c.* B.C. 400, brought into being the idea that government should aim to make it possible to live the best sort of life. It was a small contribution perhaps to civilization when the kings of smaller states conceived and put into practice the idea of getting together to defeat some particularly powerful and ambitious neighbor. It was a step out of international disorder and savagery when Burnaburiash, king of Babylon B.C. 1400, thought to improve the relations between his kingdom and that of Egypt by marrying an Egyptian princess. Militarism was often the only weapon that could be used to protect the attainments of civilization from destruction by the barbarians who frequently made war upon the settled communities. The introduction of the horse, B.C. 1900, was a benefit conferred by militarism. The need of transporting large bodies of soldiers and equipment to distant parts led to the planning and actual building of roads so essential to civilized communities.

The doctrine of the divine right of kings also became a decisive factor in the progress of civilization. About B.C. 3500 the Egyptian kings adopted the title «Son of the Sun» and the Babylonian Priest-king Gudea, B.C. 2400, was deified and worshipped after his death. The doctrine of the king as the specially chosen of the deity grew from generation to generation, giving superhuman authority to his utterances and sanctity to his person.

Commerce.— In remote prehistoric days it was found to be generally advantageous for the man who could make arrow-heads better than anyone else to keep to that job and trade his wares for the food which the hunter brought home and could spare.

With the growth of cities in the Euphratean and Nile valleys and elsewhere the city dwellers needed food and supplies of many sorts, the builders needed materials from far and near, and so commerce rapidly grew to large proportions, challenging the food growers to grow more food and others to exercise their ingenuity to devise means of transportation of this increasing commerce. Records of B.C. 2500 in Babylonia, and the same must have been true in Egypt, make mention of commercial agents, bookkeepers, grain measurers, boatmen, gardeners, capitalists, fishermen; houses and land and cattle and slaves were bought and sold; money was loaned at interest at the general rate of 20 per cent; contracts of all sorts were made and guaranteed. By B.C. 1000 the Phœnicians were altogether a commercial people establishing purely commercial towns westward beyond the Mediterannean and eastward and southward as well. These commercial cities were outposts and sources of civilization. From the very first, commerce contributed heavily to the process of civilization in that it gave rise to the spirit of fair-dealing, honesty and truthfulness.

Transportation.— Civilization can make but little headway so long as man is nothing better than a beast of burden. It is possible that in prehistoric times he began to shift burden-carrying from his own back to the backs of animals. Rafts and hollowed logs as early as B.C. 10000 may have helped in the matter. With the establishment of cities in the valleys of the Nile and Euphrates a considerable system of water transportation speedily developed. Rafts and basket-like contraptions woven of willow and rushes, lined within and covered without with bitumen, were likely the earliest type of water-carriers before B.C. 5000. Real boats did not lag far behind and the presence of a ship "with masts and decks and oars" in the Deluge legend would indicate that by *c.* B.C. 4000 water transportation had attained a high degree of development, and that somewhere near to this date over-sea ports were visited. Eannadu, *c.* B.C. 4000, one of the Euphratean kings, built brick-lined canals for transportation purposes, and the great Hammurabi *c.* B.C. 2200, complains that a navigable canal connecting Erech with the Euphrates was blocked so that the ships could not go up it. An exceedingly ambitious project was the canal dug by Pharaoh, *c.* B.C. 2000, connecting the Nile with the Red Sea. A 15th century B.C. painting at Karnak represents Queen Hatshepsut's fleet of five ships equipped with sails just returned from a voyage to the land of Punt. The seagoing vessels under the Phœnicians and the Greeks in no essential thing differ from these early boats and ships. With the establishment of harbors and docks and lighthouses (at Alexandria, B.C. 300) the mercantile marine which has had so great an influence upon the life of the world, became an important factor in the process of civilization.

Land transportation, except for the camel caravan, amounted to little because perhaps draft animals were too costly and wheeled vehicles, as seen in an 8th century inscription, impossibly cumbersome. The first real road to be planned was the highway which Alexander the Great proposed to build from Egypt to Carthage. The most notable feat of transportation was the hauling on sledges of immense blocks of stone from quarry to boat and boats to Pyramid and up to the level desired. The development of transportation made possible a thoroughly settled and organized life without which manners and customs were incapable of permanent improvement. Journeying from place to place and dealing with peoples near and far distant, men were compelled to think of the world and life in larger terms.

Science.— At a remote date man became an observer of the overhead and of things about him. Peopling the overhead and every nook and cranny on earth with beings kindly or malicious was the sum total of his attempts to know the world he lived in. The desire to know how these kindly or malicious spirits wrought their will, resulted in the great complicated system of astrology and divination which possessed the world for so long a time and still has a large place in it. The elaborate observations necessary to the working out of astrological schemes led to the discovery or invention of time divisions, a matter of utmost importance to commercial and industrial life. As early as B.C. 4241 in Egypt a calendar divided into days and weeks and months very similar to our own and containing 365 days in the year was in use. Without such a time measurement contracts of any sort could not be made, nor agreements entered into. The necessity of dividing time into small divisions to measure the length of time a man should work, led to the invention of the clock — a water or sand clock. What is known as the oldest clock in the world is the "shadow clock" bearing the name of Thutmose III, *c.* B.C. 1400. These primitive observations furnished the material out of which was eventually fashioned the science of astronomy which has done so much to rid man of the terrors of astral and meteorological spirits and make long distance navigation possible. Reasoning from what he learned from the ancient Babylonian astronomical lists, Thales told the people to expect an eclipse of the sun before the end of the year B.C. 585. Centuries before Babylonian astronomers had sometimes predicted eclipses, but the importance of the prediction of Thales is that it led him and others to realize for the first time that eclipses and other strange happenings in the sky were due not to the anger or whim of gods but to the operations of natural laws,— the first real break with superstition. The understanding of the forces and operations of nature had begun and the way was open to the serviceable use of natural forces. Eratosthenes, B.C. 200, suggested that the earth was round, that India could be reached by sailing to the westward and with surprising accuracy he computed the size of the earth. Aristarchus, *c.* B.C. 150, demonstrated that the earth and planets revolve around the sun. All ideas that give man a greater mastery, boost civilization. Such is the idea suggested in the Jacob story, Gen. xxx, 37, *c.* B.C. 850, that the character of the offspring of cattle can be controlled; and the belief set forth in Jer. xxxi, 29 that the conduct of parents affects the unborn generations.

The three centuries preceding the Christian era are notable for many important mechanical inventions or discoveries. Archimedes of Syracuse, B.C. 287 to 212, invented the pulley and lever. Screws and cranks and cogwheels and waterwheels and the endless chain came into use at this time. Euclid perfected his geometry.

Medicine.— For long centuries the people on earth were few because human mortality was exceedingly high. From the first, man suffered grievously from disease and deformities. Such conditions were an almost insuperable obstacle to the advance of civilization. Little is known of prehistoric medicine. Whether the trepanned skulls found in prehistoric strata are instances of surgery or a religious ceremony is an open question. The amulet frequently worn by neolithic peoples, *c.* B.C. 9000, is the best clue we have to the character of prehistoric medicine. During most of the historic period back of the Christian era, sickness, being considered the result of demon possession or other supernatural influence, cures were to be had by exorcism, incantation and prayers. The library of Assurbanipal has furnished a mass of literature descriptive of the disease demons and the prescriptions supposed to possess the required potency to rout them. Similar prescriptions come from Egypt dating back to B.C. 3000. Other conceptions of disease and cures were in existence as witness the seal of a Babylonian physician, Ur-Lugal-Edina, which shows as symbols of his profession, scalpel, lancets (or knives) and cups. The laws relating to doctors in the code of Hammurabi give a hint of what was being done to combat disease and deformity. The scientific treatment of disease may be said to begin with the labors of Hippocrates, B.C. 460–377. By his researches and discoveries in anatomy and physiology, made possible by the opportunity for the vivisection of criminals granted him by the king of Egypt, Herophilus, *c.* B.C. 300, laid the foundation for surgery and a more scientific medicine.

Religion.— Religion has played its part in helping and hindering and shaping civilization. The discovery at Le Moustier of the skeleton of a youth belonging to the Neanderthal race, *c.* B.C. 40000, with indications that a food offering had been made at his burial, is taken by some to show that at this early date man had some sort of belief in immortality. Apart from this instance of doubtful significance there are no other hints of religion until late Aurignacian times, *c.* B.C. 20000. Belonging to this period and widely scattered throughout Europe have been found statuettes of limestone and soapstone and plastic models of the female figure. These statuettes, usually about four and a half inches high, are believed to be household gods of these primitive folk and were carried with them in their wanderings as was done by the Hebrews some 19,000 years later (Gen. xxxi, 19). Of religion as organized around the altar or systematized into ritual, there is little evidence from prehistoric times. The belief in spirit survival which plainly prevailed among the prehistoric peoples influenced the habits of men and women. By about B.C. 8000 kings and chiefs were buried with considerable pomp and ceremonial, and whether for the purpose of appeasing the spirits of the departed or recalling to mind the virtues and worthy deeds of the dead we do not know, but it became the custom for the people to gather regularly at the tombs and hold high festival. Such festivities drew the bonds of fraternity a little tighter, the sense of community interest was quickened, and the friendly rivalry in the sports of the occasion put a little finer spirit into human relationships.

When man steps out into the increasing light of history, religion is conspicuous in his activities. He worships gods which are usually fearful and many, and believes that these gods cause all things to happen. Man does not control himself but the gods control him. It is difficult to estimate the influence on a person's character which must have been wrought by the belief that the gods watched him; that what he did either pleased or angered the gods. The whole political structure of the world at and since that early time has been greatly affected by the close association of temple and palace, ruler and priest, and the inevitable rise of the idea of the sanctity of the person of the king and the infallibility of his commands. King Gudea of Lagash, *c.* B.C. 2400, was deified and worshipped and the Egyptian kings of the fifth dynasty, *c.* B.C. 3500, claimed descent from the Sun god Ra. The choice of Saul as king, I Sam. x, 1, is another instance. Religion influenced architecture. It created the ziggurat, most conspicuous in Babylonian architecture; it fashioned the pyramids of Egypt and its great temples; the famous Greek temples and the development of art and sculpture are but the outward expression of the religious impulse and ideas. The belief that the gods could be influenced or their will learned by mysterious rites performed by specially equipped persons created the priesthood and gave it a great control of human affairs, making the priesthood a large factor in the process of civilization. The idea of deity as law-giver also profoundly affected human conduct. It gave to the crudely civilized man of *c.* B.C. 3000 a reason for obedience to law more powerful than any that had yet pressed upon him. Hammurabi is pictured, *c.* B.C. 2200, as receiving the law from Shamash, the god of law and justice. A similar origin is given to the Mosaic law. It is the deity that demands a certain kind of conduct and punishes the contrary. It was a momentous thing for civilization when, as in Amos, B.C. 750, the deity denounces hard-heartedness, greed, oppression, corruption, and the high value in the other world of good deeds and kindness here, as pictured in the Egyptian Book of the Dead about B.C. 3000, must have awakened a sense of the eternal importance of right living. The civilizing value of the idea of a God as a God of Righteousness proclaimed by the Hebrew prophets has even yet not been fully realized, and when under Josiah social justice was made virtually a religion, religion was destined to play a greater part in lifting civilization to higher levels.

Morals.— Closely bound up with religion are the moral principles which have appeared from time to time. However much civilization has always depended on material progress for its advancement it is something very much more than that. Civilization is nothing less than «the humanization of man in society.» No matter how learned, or clever or powerful, a man is not civilized unless he is in the best sense human. It was an epoch in the progress of man when Urukagina B.C. 2800 swept the whole army of political and priestly officials from office because they were guilty of taking bribes, thwarting justice and imposing exorbitant taxes. The high moral obligations which the Hebrew prophets insisted publicly that the people must meet, the rising protest against inhumanity in Greece, are simply so many added forces to the movement toward the «humanization of man in society.» The lack of moral strength has usually led to the downfall of the peoples that have been outwardly most civilized.

Culture.— About B.C. 7000 the written word becomes a fact — only a sign perhaps to indicate ownership, or a picture conveying some sort of information. Having once hit on the plan of conveying information by pictures, the pictures speedily became formalized, and still simpler forms of writing were devised.

This invention gave to life practically a new beginning. Man came to have a past as real as the present. A sense of permanence and continuity was given to life. All man's thoughts were widened. It opened the way out of the terrible ignorance which had held him down for nearly half a million years. From recording names and transactions and events man soon set to recording his thoughts, his speculations, and this set others thinking and speculating on many things. Man began to enjoy an *intellectual* life. There grew up a literature as for example the Precepts of Ptah-hotep in Egypt, *c.* B.C. 3900, by which the thoughts and achievements of one generation were passed on to the generations to come, thus making progress a surer thing. The value of the invention of writing is seen in the fact that when a man signed his name or his mark to a contract (B.C. 3000 and earlier most likely), he was held in the grip of an obligation to do what he had agreed. A new accuracy and truthfulness and honesty entered of necessity into human dealings. With the growth of commerce and politics and religion there had to be persons to keep books in the commercial houses; the kings needed scribes to make record of the king's doings; the making and administration of laws must needs have men who could write down the laws and the judgments of the courts; the temples must have men able to chronicle religious matters, and so men had to be trained for these semi-intellectual jobs. We can hardly speak of the existence of schools and yet whatever the limitations of the training given men to fill these semi-intellectual positions the effect must have been to increase the number of those who could read and write and create a desire on the part of an increasing number to be able to read and write. The school idea as we understand it is met with in Greece before B.C. 500. When old enough the boys were sent to a school conducted by some poor citizen, or an old soldier or a foreigner. Music and writing were taught, and what perhaps was of greater importance the boys learned many passages from the old poets. Of inestimable importance in the story of civilization is the school of Athens, where Socrates, Plato, Zeno and Aristotle set forth political and social and philosophical ideas which exercised a marked influence upon the thought and character of the persons then living and all generations since. The rise of the gymnasium, B.C. 300 to B.C. 200, where the youth attended lectures on rhetoric, science, philosophy and mathematics was a notable step toward creating and setting the fashion for an educated citizenship. Not least influential of the pre-Christian scholastic institutions was the school of intellectuals gathered in Alexandria, B.C. 300 and after. Men came hither from all civilized countries to listen to lectures containing the latest thought in astronomy, physics, anatomy, medicine, grammar and religion. Here the Septuagint version of the Old Testament was compiled.

The founding of libraries is an item that deserves place in this summary. Copies of laws, of religious rituals, of medical prescriptions, commercial papers, and treaties between nations multiplied and were found in considerable numbers in all important cities of the ancient world. But so far as known Assurbanipal, B.C. 668–626, grandson of Sennacherib, was the first to make a collection of the literature of the people and arrange it so that it could be used and was designed to be used. Of much greater importance was the founding of the library at Alexandria by Ptolemy, B.C. 304. The library was the creation of the gifted poet and philosopher Callimachus who originated the name «book» and created the science of publishing correct editions of old works. Here too began the making of dictionaries.

Bibliography.— The material for the history of civilization is exceedingly voluminous. All histories of ancient peoples contain matter for this purpose. For those who wish to get at the origins, the series of British Museum guides «The Antiquities of the Stone Age,» «The Bronze Age,» «The Early Iron Age,» «The Egyptian Collections,» «Babylonian and Assyrian Collections» are authoritative; for the prehistoric period, Osborn, H. F., 'Men of the Old Stone Age'; Joly, N., 'Man Before Metals'; for the historic, Jastrow, M., Jr., 'The Civilization of Babylonia and Assyria'; Boscawen, W. St. C., 'The First of Empires'; Breasted, J. H., 'Ancient Times'; Petrie, W. M. F., 'History of Egypt'; Morgan, L. H., 'Ancient Society'; Tylor, 'Primitive Culture'; for Greece, Botsford, G. W., and Sihler, E. G., 'Hellenic Civilization.'

CHARLES GRAVES,
Chaplain, New York State Assembly.

CIVILIZATION, An Introduction to the History of, a noted work by Henry Thomas Buckle, an Englishman, published 1857–61. Although the progress of science has uncovered facts that prove the weakness of an occasional principle in the 'History of Civilization,' the work remains one of the greatest contributions of modern times to the new aspect of history, as a human document, to be read by the light of scientific discovery. No book of its time was more influential in turning the direction of men's thoughts to the phenomena of social and political science.

CIVILIZATION IN EUROPE, a history, by François Guizot. In this work Guizot begins with the fall of the Roman Empire, and ends with the opening of the French Revolution. Although he analyzes all the important facts of history between the great landmark of 476 and the convocation of the States-General in 1789, he is far more anxious to grasp their import than to give a vivid relation of them; and, therefore, facts in themselves play but a small part in his exposition. They are simply a help in his effort to discover the great laws that direct the evolution of humanity, and to show its development in the individual and in society. His investigations are limited to purely social development, and he does not touch upon the intellectual side of the question.

CIVITÁ-DI-PENNE, chē'-vę tā dē pĕn'nā, Italy (the ancient Pinna-Vestina), a small town in the province of Teramo, Naples, built on two hills, 23 miles southeast of the city of Teramo. It was formerly a place of importance. The Normans, under Roger I, made it the capital of their kingdom. It is a bishop's see. Pop. 4,337.

CIVITÁ-VECCHIA, vĕk'kē-ā. See CITTÀ VECCHIA.

CIVITALI, Matteo, chē-vē-tā'lē, Tuscan sculptor and architect: b. Lucca, 5 June 1435; d. 12 Oct. 1501. He followed the occupation of a barber until about 1470, and evidently found some time to study sculpture. In 1495 he removed to Carrara, the site of the famous marble quarries. His first important work was the mausoleum erected in the cathedral at Lucca to Pietro de Noceto, secretary to Pope Nicholas V. His greatest works are, in the same church, six statues of white marble representing personages of the Old Testament; a bust of the humanist, Pietro di Avenza; two beautiful angels belonging to the former Altar of the Sacrament, the shrine of which is in the

South Kensington Museum, London; the tomb of his friend and patron, Domenico Bertini, a miniature octagon temple; the statue of Saint Sebastian; the altar of Saint Regulus, and the pulpit of the cathedral. Among his architectural works is the Bernardini palace at Lucca, of simple style, and also the little temple which contains the miraculous crucifix in the church of San Martino. He also erected a monument to Saint Romanus in the church of San Romano. The Uffizi Gallery at Florence contains Civitali's statue of 'Faith,' and another of the Saviour. The Metropolitan Museum of New York contains a charming painted terracotta 'Angel of Annunciation.' His last surviving work is the group of statues in the chapel of Saint John the Baptist in the cathedral of Genoa, in the style of the high Renaissance. As an architect and engineer, he constructed a bridge near Lucca and the fortifications of his native town. He is best classed with the Florentine School, but his style is simple and more rugged and sincere. Consult monographs by Yriati; Roselli (1891); Cappellette (1892); Volpi (1893).

CLAAR, klär, **Emil**, German stage director: b. Lemberg 1842. He was at first an actor making his début at the Burg Theatre, Vienna. Later he appeared at Gratz, Innsbruck and Berlin. In 1864–70 he was stage manager of the Stadt Theatre, Leipzig, and in 1870–71 of the Court Theatre, Weimar. From 1879 to 1900 he was director successively of two large houses at Frankfort-on-the-Main, and after 1900 was manager of the Schauspielhaus there. His published works include 'Gedichte' (1868); 'Neue Gedichte' (1894); 'Weltliche Legenden' (1898); 'Samson und Delila' (1872); 'Shelley,' a tragedy (1876); 'Die Schwesterin' (1892); 'Königsleid' (1895).

CLACKMANNAN, Scotland, the county town of Clackmannanshire, nine miles east of Stirling, on the Forth. Coal, iron and limestone are found nearby. Close to the town are the ruins of a castle of the Bruces. Pop. 2,203.

CLACKMANNANSHIRE, Scotland, the smallest county, being only about nine miles long, seven wide and comprising an area of about 34,927 acres or 55 square miles. Its greatest length is 10 miles from north to south, and is nine miles broad from east to west. It lies on the north side of the Forth, by which it is bounded southwest. On all the other sides it is enclosed by the counties of Perth, Fife and Stirling. The north border of the country is occupied by the Ochil Hills, but the other portions are comparatively level, and in general are exceedingly fertile, yielding large crops of oats, barley, wheat, turnips and other green crops. The minerals are valuable, especially coal, which abounds. There are ironworks, breweries and distilleries, woolen manufactures, tanning, glassworks, etc. Pop. 31,121, or 570 to the square mile. The county unites with Kinrossshire in sending a member to Parliament. The principal towns are Alloa (the largest, and famous for yarns), Alva, Tillicoultry, Dollar and Clackmannan; the last is the county town. It is rather poorly built, but has an interesting old tower and an old market-cross.

CLACTON-ON-SEA, England, a popular watering-place on the coast of Essex, 19 miles southeast of Colchester by rail, with admirable facilities for sea-bathing, and of easy access from London both by rail and steamboat. It stands on cliffs over 40 feet high. The church of Great Clacton, one and a half miles distant, dates partly from Norman times. Pop. 9,777.

CLADEL, Léon, klä-dĕl, French romancist: b. Montauban, 13 March 1835; d. 1902. He rose suddenly into prominence with his story, 'Les martyrs ridicules' (1862), a satirical description of the lower walks of literature in Paris. This first success was repeated with the later novels 'La Bouscassié' (1869); 'Six morceaux de littérature'; a series, 'Urbains et ruraux,' 'Une Maudite,' for which he suffered four weeks' imprisonment, and many others.

CLADIUM, klā'dĭ-ŭm, a genus of plants of the sedge family (*Cyperaceæ*), with about 30 species natives of tropical or temperate climes. They are akin to the Rynchosporas, the spikelets oblong or fusiform, few-flowered, variously clustered. Scales imbricated all around, the lower empty, the middle ones mostly subtending imperfect flowers, the upper usually fertile. It has no perianth and two or three stamens. Its style is cleft, deciduous from the summit of the achene, its branches sometimes parted. The achene is ovoid or globose, smooth or longitudinally striate. There are only three species found in America, of which the most common is the twig-rush (*C. mariscoides*), found in marshes from Minnesota eastward to Nova Scotia and southward to Florida. This plant is very common in certain of the fenny districts of England, where it is used for thatching. It flourishes from July to September.

CLADOCERA. See DAPHNIA.

CLADRASTIS, a small leguminous tree resembling the locust, with two species, one in Manchuria, the other (*C. lutea*) in eastern United States. It is called yellow wood, yellow ash, yellow locust and fustic in various places. The American or Kentucky yellow-wood is a species with smooth bark, and sometimes grows above 50 feet in the rich soils of Kentucky and Tennessee. The wood, which weighs about 40 pounds to the cubic foot, is strong and hard, and of a bright yellow color. It produces a dye of considerable commercial value, its bark having cathartic properties.

CLAFLIN, Horace Brigham, American merchant: b. Milford, Mass., 18 Dec. 1811; d. Fordham, N. Y., 14 Nov. 1885. He received a common school education, worked in his father's store until he was of age, when he went to Worcester, Mass., and in partnership with his brother-in-law, engaged in the dry goods business on a large scale. In 1843 he established in New York the firm of Bulkley & Claflin, importers and jobbers of dry goods; in 1851 it became Claflin, Mellin & Company, and in 1864 H. B. Claflin & Company, by which it is best known. Mr. Claflin conducted an enormous business extending all over the country, and since 1864 it has been the largest mercantile business in the United States, its sales in a single year having reached $72,000,000. Its financial strength, and the money market's firm confidence in Mr. Claflin's methods and integrity, enabled the firm to pass safely through most of the financial crises of the last 40 years. In 1861 and in 1873 it had to ask for slight extensions of time in which to settle accounts, but all were paid with interest before maturity. In 1864 Mr. Mellin retired from the firm and the name became H. B. Claflin & Company. Mr. Claflin was a man of domestic tastes, fond of books and horses, active in charitable institutions, and an intimate friend of Henry Ward Beecher.

CLAFLIN, John, American merchant: b. Brooklyn, 24 July 1850. He was graduated at the College of the City of New York in 1869 and in 1869–70 traveled in Europe and the East. He entered the dry goods business with his father's firm, H. B. Claflin & Company 1870, and in 1873 became a member of the firm. In 1890 he organized the H. B. Claflin Company and in 1909 organized the United Dry Goods Companies. He was president of both organizations until 1914, when he retired. He has served as trustee of many financial and charitable corporations.

CLAFLIN, William, American merchant and statesman: b. Milford, Mass., 6 March 1816; d. 5 Jan. 1905. He was educated in the public schools and at Brown University. For many years he was engaged in the shoe and leather business in Saint Louis, Mo., but later settled in Boston, Mass. He was elected to the State house of representatives 1849–53; to the senate 1860 and 1861; was a member of the Republican National Committee 1864–72; lieutenant-governor of Massachusetts 1866–68; and governor 1869–71. From 1877 to 1881 he was a Republican member of Congress. He was vice-president of Boston University 1869–72 and its president from 1872. The degree of LL.D. was conferred on him by Harvard and Wesleyan universities.

CLAGHORN, Kate Holladay, American writer: b. Aurora, Ill., 12 Dec. 1863. She was educated at Bryn Mawr College, and has been engaged in research work for the United States Industrial Commission, was registrar of records 1906–12; is connected with the New York Tenement House Department and the New York School of Philanthropy since 1912; is a member of advisory council of the Society for the Protection of Italian Immigrants. Besides contributions to periodicals, she has published 'College Training for Women' (1897).

CLAIBORNE, or CLAYBORNE, William, American colonial official: b. Westmoreland, England, about 1589; d. about 1676. He went to Virginia as surveyor in 1621 and four years later became secretary of state of the colony. In 1627–28 he explored Chesapeake Bay, in 1631 founded a trading post on Kent Island. This post flourished and in time sent a representative to the general assembly of Virginia. Kent Island was included in the grant to George Calvert, first Lord Baltimore, whom Clairborne had previously opposed bitterly in London. He took up arms to enforce his claim to Kent Island but was soon driven off. Maryland and Virginia continued to wrangle about it until 1776. When Virginia and Maryland decided in favor of Charles II, Claiborne sought and obtained a place on the Cromwellian commission appointed to reduce them to submission. When Richard Bennett became governor of Virginia under the new régime Claiborne was made secretary of state. In Maryland all Catholics were removed from office, which act caused general discontent and friction until 1658, when Lord Baltimore again came into possession of the province. After the Restoration Claiborne lost all influence at court and died in obscurity many years later. W. H. Carpenter's novel, 'Claiborne the Rebel' (1845) is based on his career. (See Virginia—History). Consult Mereness, 'Maryland as a Proprietary Province' (New York 1901); Claiborne, J. H., 'William Claiborne of Virginia' (1917).

CLAIBORNE, William Charles Cole, American politician: b. Sussex County, Va., 1775; d. New Orleans, La., 23 Nov. 1817. He received a good education, studied law at William and Mary College and engaged in its practice in Nashville, Tenn. He assisted in forming the constitution of Tennessee, and represented that State in Congress 1797–1801. In 1801 he was appointed governor of Mississippi Territory, and in 1804 of the territory of Orleans, that part of the Louisiana purchase lying south of the territory of Mississippi and of the 33d parallel. When Louisiana became a State and adopted its constitution, he was elected governor 1812–16. During the War of 1812, he assisted with Jackson in driving off the British at New Orleans. He was later elected United States senator, but died before taking his seat in that body.

CLAIBORNE STAGE, in American geology, the rocks, principally shales and limestones, laid down in Middle Eocene time along the Carolinas and the Gulf States and around an arm of the sea that reached northward to the present mouth of the Ohio River. See Eocene Series; Tertiary System.

CLAIM, a challenge of ownership of a thing which is wrongfully withheld from the possession of the claimant. The assertion of liability of some one, to the party making it, to do some service or pay a sum of money. The possession of a settler upon lands owned by a government which is not used for any particular purpose, and from which no benefit is derived. When a new section of country is opened up, the government gives to each settler a certain amount of land on condition that he will live there, and improve and cultivate the soil for a definite time. The land taken is called a claim, and the settler receives an absolute title to the property when the conditions have been complied with. The ground must be staked out so that the particular claim may be identified. Mining claims are of this nature. Generally it is required that they be staked out, that a description of the claim be filed and that a certain amount of work be done within a specified time. These claims are considered personal property until the conditions are complied with, and are subject to sale and transfer, it being necessary for all but the original settler to be able to show how and through whom he acquired title; in order to get a complete and absolute title from the government, as it is necessary to show that the land has been used, and in what manner, for a definite length of time, before the settler acquires his title from the government.

There are claims for labor and wages by mechanics for work done, by materialmen for material furnished or by pilots for pilotage. When filed of record these claims become liens against the property which has been benefited by the work, material or care bestowed upon it.

Claims, when filed in the name of a municipal corporation for improvements, such as opening or widening a street, laying sewers or any municipal improvement, are liens against the property benefited.

CLAIMS, Court of. See COURTS.

CLAIRAC, klă'răk', France, a town in department Lot-et-Garonne, on the Lot, 16 miles northwest of Agen. It was built about an abbey in the 8th century. It was the first town in the south of France to declare in favor of the Reformation, and was the scene of many conflicts between the Roman Catholics and Huguenots. It has a large trade in white wines. Théophile Viaud was born here in 1626. Pop. 2,388.

CLAIRAUT, klă-rō, **Alexis Claude,** French mathematician: b. Paris, 13 May 1713; d. there, 17 May 1765. In his 11th year he composed a treatise on the four curves of the third order, which, with his subsequent ‘Recherches sur les courbes à double courbure’ (1731), procured him a seat in the Academy at the age of 18. He accompanied Maupertuis to Lapland, to assist in measuring an arc of the meridian, and obtained the materials for his work ‘Traité de la figure de la terre’ (1743 and 1808), in which he proved, contrary to the opinion of Cassini, the flattening of the earth toward the poles. In the field of mathematics, Clairaut studied curves of the third order, tortuous curves and projections, and was the first to find the singular solution of a differential equation of the first degree in X and Y. The equation used by Clairaut, often called Clairaut's form, is $y = px + f(p)$ in which $p = \frac{dy}{dx}$. In physics, he explained capillary action by demonstrating the necessity of considering the attraction between the parts of the fluid itself; computed the change in gravity at a high altitude, and so fully demonstrated the figure of the earth that little essentially new has since been added. In 1752 he published his ‘Théorie de la lune’ (1752 and 1765), and in 1759 calculated the return of Halley's comet. Besides the works already mentioned, he wrote ‘Eléments de géométrie’ (1741 and 1765); ‘Eléments d'algèbre’ (1746 and 1760); ‘Théorie du mouvement des comètes’ (1760). A brother, who died at the age of 12, published in his ninth year a treatise entitled ‘Divers Quadratures of Circular Elliptics.’

CLAIRIN, klă-răṅ, **George Jules Victor,** French portrait painter: b. Paris, 11 Sept. 1843. He studied in Paris under Picot and Pils, and obtained a second class medal at the Paris Exposition in 1889, and the Legion of Honor medal in 1888. Besides portraits he has painted several brilliant scenes from Spanish history. His paintings are fine in color, effective in composition and have always aroused wide interest. Among them are ‘The Benediction of the Swords’; ‘Allah! Allah!’; ‘The Two Hostile Tribes’; ‘After the Victory’; ‘The Massacre of the Abencerrages’; ‘A Moorish Sentinel’ (Metropolitan Museum, New York); ‘Entering the Harem’ (Walters Gallery, Baltimore). His portraits include those of Mounet-Sully as Hamlet (1889), Sarah Bernhardt and Madame Krauss. He also executed a number of effective decorative paintings in the Paris Opera, the Bourse and in the Salle-des-Jeux at Monte Carlo.

CLAIRVAUX, klăr-vō' (*clara vallis,* lightsome vale), a village of northeast France, on the river Aube, 40 miles southeast of Troyes, noted as the site of the celebrated abbey of Cistercian monks, founded in 1115 by Saint Bernard, who was its abbot till his death in 1153. It was a vast establishment, comprising within its enclosure a large population both of monks professed, lay brothers, laborers and artisans employed in various industries. There was a large and magnificent church; four cloisters surrounded by buildings for housing the monks, *conversi* or lay brothers, the novices and the superannuated members of the order; the abbots' hall with the guest house adjoining it, the kitchen, refectory, infirmary, scriptorium, etc.; all these were grouped in one portion of the monastic domain. In another portion were the fish tanks, the wine-press, slaughter-house, barns and stables, saw-mill, grist-mill, oil-mill, tannery, tile works, etc., producing all necessary supplies for the use of the inmates. At the Revolution the monks were turned out and the lands and buildings, except the church which was destroyed by fire, occupied for public uses; the buildings are now used as a penitentiary and workhouse.

CLAIRVOYANCE (Lat. *clarus,* clear, + *videre,* to see), defined as the power of perceiving without the use of the organ of vision or under conditions in which the organ of vision with its natural powers alone would be useless. It comprises the sight of things past, present or future. Various methods of clairvoyance are recounted; by direct vision of things at a distance (opaque substances being no hindrance); by looking into a black surface; by looking into water, into a crystal, etc.; or by laying the object to be described on the forehead or chest of the clairvoyant; but clairvoyants now usually represent the cerebral region as the seat of illumination. From remote antiquity the possession of such powers by favored individuals has been believed. In the Old Testament (2 Kings vi, 15–17) is an account of the opening of the inner vision in the case of the servant of Elisha in answer to the prayer of the prophet.

Clairvoyant powers were claimed for the Pythia at Delphi. Apollonius of Tyana and Diodorus Siculus testify to the clairvoyance of the Indian sages. Macrobius gives an instance of clairvoyance on the part of the oracle of the Heliopolitan god when consulted by the Emperor Trajan. Tertullian speaks of a seeress who could prophesy and prescribe for the sick. Clairvoyance was known among the nations of antiquity, and is still generally accepted as an undoubted fact among Eastern nations. As instances of clairvoyants in later times may be mentioned Jacob Böhme (1575–1624) and Emanuel Swedenborg (1688–1772), the Swedish scientist and founder of the religious body called “The Church of the New Jerusalem.”

The phenomena of clairvoyance have been carefully observed. The clairvoyant state seems to be intimately connected with the mesmeric, the somnambulistic and the so-called “biological.” Mesmeric somnambulism and clairvoyance were first brought to notice by Puységur in 1784. The clairvoyant is usually in a state of trance, which may be induced by mesmeric passes. In this state he is sometimes conscious only of his mesmerizer; in others, his clairvoyance is unrestricted; but the clairvoyant may enter the trance state spontaneously, or he may even be in possession of his ordinary faculties, both of which characteristics are to be found in Zschokke, the German novelist. In «second-sight,» as found in Denmark, parts of Germany and especially in the Highlands of Scotland, the seer is not in a state of trance similar to that in other forms of clairvoyance. Others consider that the results are to be explained by telepathic communication between the minds of one or more living persons and that of the percipient. Some modern scientists claim that the discovery of the X-rays, by Röntgen, in 1895, has solved a number of the questions raised by clairvoyance. Consult Flournoy, 'From India to the Planet Mars' (New York 1900); Podmore, 'Apparitions and Thought Transference' (London 1895); Hyslop, 'Enigmas of Psychical Research' (Boston 1906).

CLAM. While the vernacular name clam is indiscriminately applied to any large edible bivalve, it usually refers to the northern «long» or soft-shelled clam (*Mya arenaria*), in distinction from the round clam, hard-shell clam, or quahog (*Venus mercenaria*), which extends from Cape Cod southward, though occasionally found as far north as the Maine coast (Casco Bay) and the Gulf of Saint Lawrence at Shediac. The soft-shelled clam occurs throughout the Atlantic Coast from North Carolina to Greenland, and on the British shores, where it is called «gaper,» and is everywhere on the American coast a valuable article of food. The so-called black «head» is the siphon, which is very extensible and divided by a fleshy partition into two passages, opening out by two orifices surrounded by a circle of delicate sensitive tentacles; into the lower opening passes the sea-water, carrying minute animals, young and old, and diatoms, around to the mouth, which is in the larger end of the body; through the other or upper opening of the siphon the excrementitious matter is expelled. The clam has a tongue-shaped «foot,» by which it burrows into the mud or sand to a depth of several inches. The clam may be of either sex, male or female; it is very prolific, extruding an inconceivable number of eggs into the sea, where they are fertilized. The young larvæ (veligers) swim at the surface, where they are borne in all directions, until after a few days, the shells becoming heavier, they sink to the bottom, and, resting on the seaweed or stones at the bottom, the «spat» become attached by a few byssus threads. Clams begin to spawn by the end of the first year of their life, and in Narragansett Bay are sexually mature and the eggs become ripe when the animal is only an inch long. The breeding season begins in May, reaches its height in June and ends in July. Of course clams cannot feed when the tide is out, hence they grow more slowly when living near high-tide line. When the young begin to burrow, and they dig very rapidly during the first two months of their life, when one-quarter to one-half inch in length, they are attacked by crabs, eels and starfish (q.v.). In Rhode Island attempts at restocking clam beds and raising clams artificially have met with success and promise valuable results in clam-culture. Clams have been taken five and three-quarters inches long, and weighing 15 ounces. Attempts have been made to plant the clam on the Pacific Coast.

The round, or little-necked clam, or quahog, as it is called in New England, lives in the sand from Cape Cod to Texas, just below low-water mark, and abounds at the mouth of estuaries. The shell is heart-shaped, the valves very thick and heavy. This bivalve is fished by means of long rakes and tongs, or is dredged like oysters. It has a very large «foot,» and plows through the sand, but does not burrow deeply.

The beach, surf or hen clam is *Spisula* (formerly *Mactra*) *solidissima*. The large edible species of the southern coast is the painted clam (*Callista gigantea*). Several large Pacific Coast bivalves are edible and known as clams, being species of Taper, Laxidomus and Glycimens. Very unlike any edible clam is the «giant clam» (*Tridacna gigas*) of the coral reefs of the Pacific Ocean, whose shell often weighs upward of 400 pounds and whose soft part amounts to 20 pounds of edible flesh. Consult Mead, '30–33d Annual Reports of the Commissioners of Inland Fisheries of Rhode Island'; Mayer, 'Sea-Shore Life' (New York 1906).

CLAM-GALLAS, klăm′-gäl′las, **Eduard**, Count, Austrian general: b. Prague 1805; d. 1891. He entered the army in 1823 and reached the rank of major-general in 1849. In 1848 he commanded the Transylvanian corps which joined the Russians and defeated Bem at Sepsi-Saint György. He commanded the First Division of Bohemian Regulars in 1850 and won distinction at Magenta and Solferino in 1859. In 1866 he was defeated by the Prussians at Hühnerwasser, Podol, Münchengrätz and Gitschin. These disasters led to his appearance before a military tribunal, which acquitted him because the chief responsibility for the several defeats was traceable to his superiors.

CLAMECY, klä-mē-sē′, France, town in the department Nièvre, 38 miles northeast of Nevers, left bank Yonne, at the mouth of the Beuvron. It was formerly surrounded by enormous walls, and defended by a castle which commanded the town and environs. One of its suburbs, situated on the opposite side of the Yonne, was the seat of a bishopric *in partibus*, known as the bishopric of Bethlehem, founded in 1180 for the bishop of that place, who had been expelled by the Saracens. Wood-rafts for the supply of Paris with fire-wood are made up here, and floated down the Yonne and Seine. The parish church, founded in 1497, is remarkable for its tower and for some fine sculptures. Clamecy carries on several industries, the chief being that of tanning. Pop. 4,869.

CLAN (Gael. *clann*, Ir. *clann, cland*, offspring, tribe), a tribe or number of families, bearing the same surname, claiming to be descended from the same ancestor and united under a chieftain representing that ancestor. The members shared certain rights and privileges, and vowed solemnly to avenge each other's wrongs. The clan system is essentially the same as that existing among the Arabs, the Tartars and tribes similarly situated. The clan differs from the village or pagus, which was the first step toward the enlarging of tribal life. From ancient times the «clans» existed in Ireland. The system is said to have sprung up in Scotland about 1008, while Malcolm II was reigning, but it may have been of greater antiquity. In 1747 the legal authority of the chiefs over their followers was abolished as a punishment for the part which the former had taken in the insurrection which ended in 1745 at Culloden. While the clans flourished they were divided into two, the clans of the borders and those of the highlands. Consult Mayne, 'Hindu Law and Usage' (London 1883); Morgan, 'Ancient Society' (New York 1878); Leist, 'Græco-italische Rechtsgeschichte' (Jena 1884); Meyer, 'Geschichte des Altertums' (Vol. II, Stuttgart 1893); Krauss, 'Sitte und Brauch der Südslawen' (Vienna 1885); Skene, 'Celtic Scotland' (3 vols., Edinburgh 1876–80); Lang, 'The Secret of the Totem' (London 1905); Bradley, 'Malta and the Mediterranean Race' (London 1912).

CLAN-NA-GAEL, klăn-na-găl, Irish secret society, founded in the United States for the purpose of aiding in securing «Home Rule» for Ireland. The Society has been charged with some grave crimes, said to have been perpetrated for the purpose of intimidating the British government; but so little is really known about the workings of the organization nothing positive can be asserted.

CLAOSAURUS, klā-ō-sôr'us, **TRACHADON,** or **TRACHODON,** a genus of duck-billed dinosaurs (see DINOSAURIA) of the Cretaceous Period. This dinosaur was bipedal, herbivorous, resembling the hadrosaurus (q.v.), but the bill was not so broad. Its remains are found in the Upper Cretaceous formations of North America. A mounted skeleton possessed by Yale University is 30 feet long and stands 14 feet high.

CLAP, Roger, American pioneer: b. Salcomb, Devonshire, England, 6 April 1609; d. Boston, Mass., 2 Feb. 1691. He came to America in 1630, and with other colonists settled the present Dorchester, Mass. In the course of his life he held several military and civil offices, being captain of Castle William 1665–86, and representative in the general court 1652–56. His 'Memoirs,' written for the instruction and benefit of his children, were originally published by Rev. Thos. Prince (1731). Other editions are 'Memoirs of Roger Clap; Relating Some of God's Remarkable Providences to Him in Bringing Him Into New England' (Boston 1807; Pittsfield 1824; and an edition with preface, etc., printed by the Dorchester Antiquarian and Historical Society, Boston 1844).

CLAP, Thomas, American clergyman: b. Scituate, Mass., 26 June 1703; d. New Haven, 7 Jan. 1767. He was settled as a minister at Windham, Conn., in 1727, and in 1739 was elected president of Yale College. He contributed much to improve that institution, and through his efforts a college edifice and chapel were erected. He was a man of extensive erudition, gave great attention to mathematics and astronomy and constructed the first orrery made in this country. He published a 'History of Yale College' (1766); 'Nature and Foundation of Moral Virtue and Obligation' (1765); 'Nature and Motion of Meteors' (1781), etc.; and had made collections for a history of Connecticut; but most of his manuscripts were plundered in the expedition against New Haven, under General Tryon. He had a controversy with President Edwards respecting Whitefield, and opposed the latter, not so much upon religious grounds as from a misapprehension of Whitefield's designs.

CLAPBOARD, klăp'bōrd, colloq. klăb'ȯrd, a thin, narrow board commonly used for covering the sides of wooden buildings. Clapboards are usually of white pine, four feet long and eight inches wide and are made much thinner on one edge than on the other, so that when nailed on to each other one can lap a little over the one next below it. This makes the covering of the building much tighter than if the boards were only set together one above the other and keeps the rain from driving in. Clapboards are sawn out of solid logs, not by sawing them clear through, as in making common boards, but by sawing from the outside to the middle or heart of the log. They are thus made thicker on the outside than on the inside. They are afterward smoothed in a planing machine.

CLAPHAM, a southwest suburb of London, lying a mile south of the Thames and adjoining Battersea, with which it forms a parliamentary borough, three miles south-southwest of Saint Paul's. Pop. 51,353. Clapham Common is still an open common of 200 acres. Clapham Junction, in Battersea parish, is one of the busiest and most perplexing railway junctions in the world.

CLAPHAM SECT, a name given by Sydney Smith to the Evangelical party in the Church of England; the Rev. Henry Venn was the vicar of Clapham, and some of the most eminent Evangelicals — Zachary Macaulay, Wilberforce (q.v.), E. J. Eliot, James Stephen, Charles Grant, Henry Thornton and the Rev. W. Romaine — lived there. Thackeray's 'Newcomes' has made the phrase familiar to a later generation.

CLAPNET, a ground net used by bird catchers, consisting of two equal parts about 12 yards long by 2½ wide, and each having a slight frame. They are placed about four yards apart, and are pulled over by a string so as to enclose any birds on the intervening space. They are much used by the bird catchers who supply the London market.

CLAPP, Cornelia Maria, American zoologist: b. Montague, Mass., 17 March 1849. She was graduated at Mount Holyoke College in 1871, and studied also at Syracuse University and the University of Chicago. In 1896 she became professor of zoology at Mount Holyoke. From 1888 to 1902 she carried on investigations at the marine biological laboratory at Woods Hole, Mass. She has contributed articles to technical journals on professional topics.

CLAPP, Henry Austin, American dramatic critic: b. Dorchester, Mass., 17 July 1841; d. there, 19 Feb. 1904. He was for many years clerk of the Supreme Judicial Court of Massachusetts and a well-known dramatic critic on the Boston press. He also lectured extensively on Shakespeare. He published 'Reminiscences of a Dramatic Critic' (1902).

CLAPP, Moses Edwin, American legislator: b. Delphi, Ind., 21 May 1851. He was graduated LL.B. at the University of Wisconsin in 1873 and was admitted to the bar in the same year. In 1878–80 he was county attorney of Saint Croix County and attorney-general of Minnesota in 1887–93. In 1896 he was candidate for the Republican nomination for governor and in 1901 he was elected to fill the unexpired term of C. K. Davis in the United States Senate. He was re-elected in 1905 and 1911.

CLAPPERTON, Hugh, Scottish explorer: b. Annan, Dumfriesshire, Scotland, 1788; d. near Sokota, central Africa, 13 April 1827. He entered the merchant service, but was impressed into the navy, served in the East Indies and on the Great Lakes in the War of 1812, becoming a lieutenant; returned to England in 1817. In 1822, with Dr. Oudney and Denham, he went to Africa, where he remained till 1825, returning with valuable information, though the disputed question of the course of the Niger was left undecided. On his return to England Clapperton received the rank of captain, and, with Richard Lander, who published an account of his chief's experiences, and three others who died early in the expedition, he immediately engaged in a second expedition, to start from the Bight of Benin. Leaving Badagry in December 1825, he penetrated to Katunga, within 30 miles of the Quorra or Niger, but was not permitted to visit it. At Soccatoo the Sultan Bello refused to allow him to proceed to Bornu and detained him a long time in his capital. He was the first European who traversed the whole of central Africa from the Bight of Benin to the Mediterranean. Consult Lander, ‘Records of Captain Clapperton's Last Expedition’ (1830), and the narrative by Oudney.

CLAQUE, klăk, a body of paid applauders at a public performance, according to tradition, an invention of Nero's. The recollection of this gave a 16th century poet, Jean Daurat, the idea of the modern claque. In 1820 this body of people was organized by M. Santon who opened an office for the supply of claquers. By 1830 the claque had become a regular institution. There are several orders of claques. The *chef de claque* studies the piece and leads the applause. The *commissaire* learns the piece by heart and calls the attention of his neighbors to the good parts between the acts. The *rieurs* laugh loudly at the jokes. The *pleureurs* feign tears at the sad parts; the *chatouilleurs* keep the audience in good humor and the *bisseurs* simply clap their hands to secure encores. At the present time the claque is a recognized feature of theatrical management in Paris, and although said to be employed in London and New York, the use of such artifices is not recognized as legitimate outside of the French capital.

CLARE, Israel Smith, American historian: b. Lancaster County, Pa., 24 Nov. 1847. He has published ‘Illustrated Universal History’ (1876); ‘Complete Historical Compendium’ (1884); ‘Library of Universal History’ (1890); ‘History of British-Boer War’ (1900); ‘Illustrated History of All Nations’ (15 vols., 1906); ‘True History of the Human Race’ (1916). He has also published 45 historical maps, a series of historical poems and many newspaper and magazine articles on historical, economic and foreign political subjects.

CLARE, John, English peasant poet: b. Helpstone, Northamptonshire, 13 July 1793; d. Northampton, 20 May 1864. He led a rambling, unsteady life until 1818, when he was obliged to accept parish relief. In 1820 his ‘Poems Descriptive of Rural Life and Scenery’ met with a favorable reception, and the issue of his ‘Village Minstrel’ in 1821 won him many friends. A subscription furnishing him with £45 annually was, however, dissipated by 1823, and his ‘Shepherd's Calendar’ (1827), which he hawked himself, was not a success. He brought out a new work, the ‘Rural Muse,’ in 1835, but became insane shortly afterward, and the greater part of his subsequent life was passed in the Northampton Lunatic Asylum. Clare was a genuine poet, and his pictures of rural life are eminently truthful and pleasing.

CLARE, Saint, or **SAINT CLARA,** Italian nun: b. Assisi, 11 July 1194; d. 11 Aug. 1253. She was born of a noble family of Assisi. When very young she was attracted by the accounts of the work being done by Saint Francis (q.v.), a young man of her native place. At an early age she decided to give her life wholly to God and to work for him in poverty. She sought and received the advice of Saint Francis, and when only 18 years of age, gave up the world and began to devote herself wholly to charity. Other pious young women soon joined her and in time a recognized religious order was founded. For some years they had no special rule, but in 1218 they adopted the rule of Saint Benedict. Later (1224) Saint Francis gave them a rule, mitigating the rigors of the fast, but recognizing holy poverty in the extreme. Two years after her death she was canonized by Alexander IV. The order which she founded is known throughout the world as “Poor Clares”; but several branches of the order have been established as “Order of Saint Clara,” “Capuchin Poor Clares” and the name by which first known, “Order of Poor Ladies.” Another and a correct title is “Second Order of Saint Francis.” The differences in the branches are the rules of poverty. Saint Clare allowed none of her nuns nor herself to hold property individually nor as a body. She followed the practice of Jesus Christ. They did not own the houses in which they lived. Some of the branches, as a body, have corporate rights of property. At the end of the 16th century they numbered nearly 50,000. The nuns devote themselves chiefly to the education of the young. They are under the jurisdiction of the General and Provincials of the Friars Minor. The story of the life of Saint Clare is found in the Bollandist ‘Acta Sanctorum on the 11th of August,’ and sketches in various ‘Lives of the Saints.’ Saint Clare is known by the name “Princess of Poverty.” See ORDERS, RELIGIOUS.

CLARE, Ireland, maritime county in the province of Munster; boundaries north and east, Galway Bay and county; east and south, the Shannon separating it from Tipperary, Limerick and Kerry; west, the Atlantic. Area, 852,389 acres. Less than one-fifth of this area is under tillage, 80,000 acres are under water and what remains is under grazing or bog and mountain land. The cliff scenery on the coast is magnificent. The surface is irregular, rising in many places into mountains of considerable elevation, particularly in the east and west and northwest districts. The grazing lands are excellent; the chief minerals are limestone, lead and slate, and in the southwest coal; the mineral deposits are almost undeveloped. The chief crops are oats and potatoes. Sheep and cattle on the hillsides, salmon in Clonderlaw Bay, the rivers Shannon and Fergus and at Dunbeg are sources of income. There are oyster beds near Ballyvaughan and along the shores of Burren. Frieze and hosiery are manufactured. The chief town is Ennis. Pop. 104,232, of which 98 per cent are Roman Catholics.

CLARE COLLEGE, University of Cambridge, founded in 1326, and first called «University Hall.» In 1336 its patronage was given by Richard de Baden, then chancellor of the university, to Elizabeth de Burgh, sister of the Earl of Clare. Her object in giving of her riches to this college was to educate young men who would become priests, in order to replace the many clergymen who died from the plague. Many noted men have been educated in this school, among them Bishop Latimer and Archbishop Tillotson. In 1914–15 there were a master, 17 fellows, 32 scholars and 36 undergraduates. There are fellowships open to B.A.'s or persons of a higher degree, without restriction as to marriage. The master and fellows elect to the vacant fellowships, and the master is elected by the fellows. The foundation scholarships are eight of not less than $300, eight of not less than $200, eight of $100, four of $250 per annum each; three of about $300 per annum, tenable for three years, with preference to clergymen's sons, with several minor scholarships.

CLAREMONT, Cal., village in Los Angeles County, on the Atchison, T. and S. Fé Railroad, 35 miles east of Los Angeles. This is the centre of a large fruit growing and raisin making region, and large crops of oranges and lemons are raised here. It is the seat of Pomona College, a Congregational institution, founded in 1888. Value of its tenable property is $1,464,410. Pop. 1,114.

CLAREMONT, England, a mansion situated at Esher in Surrey, 15 miles southwest of London. Early in the 19th century it was the residence of Prince Leopold of Saxe-Coburg, afterward king of the Belgians. Louis Philippe, king of the French, resided here in 1848–50 and died there. It was long the headquarters of the Orléans party.

CLAREMONT, N. H., town in Sullivan County, on the Boston and Maine Railroad, 50 miles north of Concord. The cotton- and woolen-mills obtain their power from the Sugar River. There are also paper-mills, shoe factories, a diamond drill factory, and lumber, granite, brick and marble yards. There are two national banks with a combined capital of $200,000; Stevens High School, and the Fiske Free Library, founded in 1873 and containing 8,000 volumes, are located there, and the town has six churches. The town was first settled in 1767, the predominating nationality in the population now being French Canadian. Claremont contains a Carnegie library and owns its waterworks. Pop. 7,529.

CLAREMORE, Okla., city and county-seat of Rogers County, 25 miles north of Tulsa, on the Saint Louis and San Francisco and the Saint Louis, Iron Mountain and Southern railroads. Since 1903 it has become popular as a health resort, owing to the discovery at that time of medicinal springs. It is a stock-raising and oil centre. There are brickworks. The waterworks and electric lighting plants are the property of the city. Pop. 2,866.

CLARENCE, Dukes of, a title of English dukes whose origin and early history is identical with that of the family of Clare, earls of Gloucester, who are sometimes called «earls of Clare,» of which «Clarence» is a later form.

The 1st Duke of Clarence was LIONEL OF ANTWERP: b. Antwerp, 29 Nov. 1338; d. Alba, 7 Oct. 1368. He was the third son of Edward III, who received the title through his wife, Elizabeth, a direct descendant of the Clares, who brought lands called the «Honour of Clare» as part of her dowry. He took possession of her large Irish inheritance and was created Earl of Ulster. Although made governor of Ireland, his authority was ineffective and he returned in disgust to England. After the death of Elizabeth he was married to Violante of Pavia and died during the wedding festivities. Chaucer was at one time a page in the household of Lionel. His only child, Philippa, married the 3d Earl of March, by which union Clarence became the ancestor of Edward IV.

The next was THOMAS, DUKE OF CLARENCE: b. 1388; d. 1421. He was lieutenant of Ireland (1401–13); commanded the English fleet (1405); opposed his elder brother who was afterward Henry V; was for a short time at the head of the government, leading an unsuccessful expedition into France in 1412. When his brother became king, Thomas became a member of the royal council. He was present at Harfleur and led the assault on Caen in the expedition into Normandy. He was killed at Beaugé whilst attacking the French and their Scottish allies. He left no legitimate issue and the title again became extinct. It was resumed by GEORGE, DUKE OF CLARENCE, English prince: b. Dublin, 21 Oct. 1449; d. London, 18 Feb. 1478. He is chiefly celebrated for his tragical end, and for the use made of his name and history by Shakespeare. He was the son of Richard, Duke of York, and brother of Edward IV, king of England, and on his brother's accession to the crown in 1461 he was, as the reward of his assistance, created Duke of Clarence, and in 1462 lord-lieutenant of Ireland. When the Earl of Warwick deserted the cause of Edward, Clarence entered into alliance with him, married his daughter in 1469, retired with him to France and afterward landed with him at Dartmouth in September 1470, and in a Parliament held at Westminster by the Lancastrians had the crown settled on him, failing the issue of Henry VI. Clarence had already meditated a double treachery before leaving France, and at Coventry, on 30 March 1471, he left the party he had espoused on the field of an imminent battle and joined his brother Edward. After Warwick's death Clarence seized his estates and was created Earl of Warwick and Salisbury in his wife's name. Clarence's wife having died in 1476, he offered himself, on the death of Charles the Bold, to Mary, heiress of the estates of Burgundy, but the king opposed his suit, which hardly needed his opposition to cause it to miscarry. Some of his servants were about the same time hurriedly put to death on an accusation of magic. Clarence appeared in the council to complain of the injustice of their sentence. For this interference with justice he was committed to the Tower. A parliament was summoned which condemned him to death, and he was found dead in the Tower. He was survived by two children, Margaret, Countess of Salisbury, and Edward, Earl of Warwick. Consult Stubbs, W., 'Constitutional History' (Vol. III, Oxford 1895); Ramsay, J. H., 'Lancaster and York' (Oxford 1892); Oman, C. W. C., 'Warwick the Kingmaker' (London 1891). On the title generally see Cokayne, G. E., 'Complete Peerage' (1887–98).

CLARENCE HARBOR, a bay on the west coast of Alaska, 45 miles southeast of Cape Prince of Wales. It is in Seward Peninsula, on the east side of Bering Strait. An Eskimo village, Port Clarence, has long been situated on the northeast short. Here in May 1892 Dr. Sheldon Jackson, the commissioner of education for Alaska, established the Teller Reindeer Station, as an industrial school for instructing the natives in the management and propagation of the domestic reindeer.

CLARENCE ISLAND, (1) An island south of South America and west of Tierra del Fuego; lat. 54° 10′ S., long. 71° 20′ W. (2) An island of the South Shetland group, south of Fuegia. Lat. 61° 16′ S. It is glaciated.

CLARENCE RIVER, a large river of Australia, rising in the McPherson Mountains and flowing eastward for about 250 miles through a fertile valley into Shoal Bay, New South Wales. It is navigable for 50 miles, to Grafton for vessels of 10 feet draught, and small steamers ply to Moleville, 30 miles farther up. It has a bar at its mouth where there is a lighthouse, lat. 29° 25′ S., long. 153° 25′ E., and a costly breakwater.

CLARENCE STRAIT, (1) In the Persian Gulf, between the island of Kishm and the mainland. It is from 3 to 13 miles broad and has many islands. (2) In Alaska, between the Prince of Wales Archipelago and Duke of York Island. (3) In Australia, the channel between Melville Island and the northwest coast, communicating with Van Diemen Gulf.

CLARENCIEUX, or **CLARENCEUX,** klar'ĕn-shoo, or su, an officer of the English heraldic college. The jurisdiction of this provincial king-of-arms includes England south of the Trent; that of Norroy, the second king-of-arms, the territory north of that river. The duties of the office include the granting and survey of arms, the registry of descent and marriages, etc. It takes its name from the Duke of Clarence, son of Edward III.

CLARENDON, Edward Hyde, EARL OF, English statesman: b. Dinton, Wiltshire, 18 Feb. 1609; d. Rouen, France, 9 Dec. 1674. He commenced his political career in 1640, when he was returned to Parliament. In this Parliament he argued in favor of a grant to the king, which was successfully opposed by Hampden. He was returned to the Long Parliament (November 1640) by the borough of Saltash, and laid aside his legal business to devote himself to his parliamentary duties. At first he acted with the more moderate of the popular party, but soon found reason to change his course. A dread of democracy seems first to have led him to oppose his former friends, and his speeches and votes soon attracted the favorable notice of the court. He was offered the solicitor-generalship, which he declined, but agreed, at the king's request, to consult with his regular advisers, Falkland and Colepepper. Hyde was an honest and independent supporter of the royal authority, disposed to make moderate concessions to the popular demands and in no way responsible for the rash measures of the king, which were often taken without consulting any of his advisers. Upon the breaking out of the civil war he attached himself to the king's party, became Chancellor of the Exchequer and member of the privy-council; and after vainly attempting to bring about a reconciliation between the contending parties, was appointed by the king to wait upon the Prince of Wales, who was first sent with an army to the west. Afterward, on the continued ill success of the royal party, he retired to Jersey in 1646. Here he remained for two years, while the prince was in France, and during that time began his 'History of the Rebellion.' He likewise composed in Jersey the various writings which appeared in the king's name as answers to the manifestoes of the Parliament. On the capture of the king, Hyde received orders to rejoin the Prince of Wales, but was becalmed and taken prisoner by pirates from Ostend. In September 1649 he rejoined Charles at The Hague, who sent him to Madrid to see if any assistance could be obtained from the Spanish court. On the failure of this negotiation he retired to Antwerp, but soon resumed the business of the exiled court, of which he continued to be the most trusted adviser, first at Paris and afterward at The Hague, where Charles II appointed him Lord-Chancellor of England in 1658. After Cromwell's death Edward Hyde contributed more than any other man to the success of the measures which placed Charles II on the throne. He subsequently possessed the entire confidence of the king, who loaded him with honors. In 1660 he was created Baron Hyde, and in 1661 Viscount Cornbury and Earl of Clarendon. Many events occurred to disquiet him in the licentious court of Charles II; among these was the marriage of the Duke of York, the king's brother, to his daughter. The Duke, while at Breda, the residence of his sister, the Princess of Orange, became acquainted with Anne Hyde, Clarendon's eldest daughter, maid of honor to the princess, and married her secretly, 3 Sept. 1660, in order to legitimize their first child, born on 22 October. Anne was acknowledged as Duchess of York in December 1660, and two daughters, Anne and Mary, were of the fruit of this marriage, both of whom ascended the British throne. In 1663 Lord Bristol made an attempt to impeach the chancellor in Parliament, which, though some of the acts of Clarendon's administration were questionable, proved unsuccessful. The Duke of Buckingham, moreover, was continually laboring to make the chancellor ridiculous in the eyes of the king, and his position as chancellor made the nation regard him as answerable for all the faults of the administration. The ill success of the war against Holland, the sale of Dunkirk and other events excited public indignation. The king's displeasure was changed into hatred when he saw his plan of repudiating his wife and marrying Lady Stuart defeated by Clarendon, who effected a marriage between this lady and the Duke of Richmond. The king deprived him of his offices and an impeachment for high treason was commenced against him. The Lords refused to imprison him on a general accusation by the Commons. This gave rise to a dispute between the two houses, to end which Clarendon retired to Calais, leaving an exculpatory letter to the Lords, which they communicated to the Commons, who ordered it to be burned by the common hangman. The Lords still refused to join in his attainder, but agreed with the Commons in an act of banishment and incapacity. The hatred of the nation pursued him even to the Continent. At Evreux he was attacked by some British sailors, dangerously wounded and with difficulty rescued from their hands. He passed the next six years at Montpellier, Moulins and Rouen, at which latter place he died. His remains were afterward carried to England and buried in Westminster Abbey. Lord Clarendon, as long as he was minister, was the friend and supporter of the king against the factious and the defender of his country's freedom against the abuse of the royal power. Ingratitude and prejudice the more easily ruined him, as his stern and proud character prevented his gaining friends. Among his many writings, the most important is the 'History of the Rebellion, from 1641 Down to the Restoration of Charles II.' It is the most valuable of all the contemporary accounts of the Rebellion, and contains many excellent pen portraits of the chief actors in its events, but it is somewhat unequal, digressive and lacking in proportion. Consult Lister, 'Life of Lord Clarendon' (1838).

CLARENDON, George William Frederick Villiers, 4TH EARL OF, English statesman: b. 12 Jan. 1800; d. 27 June 1870. By his mother, Lord Clarendon was indirectly related to the Hydes, the family of the great Earl of Clarendon, author of the 'History of the Rebellion.' He was educated at Cambridge, entered the diplomatic service at an early age and in 1833 was appointed Minister-Plenipotentiary to the court of Madrid. He was instrumental in negotiating a treaty, signed in 1834, called the Quadruple Alliance, in which the four contracting parties — England, France, Spain and Portugal — agreed to unite in expelling Don Carlos and Don Miguel, pretenders to the Spanish and Portuguese crowns, from the Peninsula.

In 1838 Lord Clarendon succeeded to his uncle's title. In January 1840 he was appointed lord privy-seal; and was lord-lieutenant of Ireland from May 1847 to February 1852. The most notable events of this latter period were the great Irish famine and the rebellion headed by Smith O'Brien. Lord Clarendon's administration in regard to both of these difficulties was both firm and philanthropic; but his early popularity somewhat declined in Ireland, which was perhaps due to his impartiality in declining to favor the zealots either of the Roman Catholic or the Orange party. He was Secretary of Foreign Affairs in 1853–58 and during this period the Crimean War was concluded, Clarendon being one of the British negotiators of the treaty of peace. He was again Foreign Secretary in Mr. Gladstone's administration in 1870 until his death.

For the office of Foreign Secretary, Lord Clarendon was generally admitted to possess high qualifications; but it was complained, even by his admirers, that he adhered too much to the tradition of secrecy attaching to the foreign office. As a statesman he was remarkable rather for liberality and large-heartedness, which gave a conciliatory tone to his negotiations with foreign powers, and for the undeviating rectitude of his conduct, than for any commanding qualities of intellect.

CLARENDON, Ark., town, county-seat of Monroe County, situated on the White River, on the Saint Louis and Southwestern and the Saint Louis, Iron Mountain and Southern railroads, 58 miles southeast of Little Rock. It is in a rich cotton-growing region and has lumber mills, boat-oar, barrel, button, plow-beam, wagon-material, telegraph and telephone supply and shoe-last factories; a foundry, cotton-gins, saw and planing-mills and bottling-works. Pop. 2,037.

CLARENDON, England, a lodge in Wiltshire, near Salisbury. It is noted chiefly for being the place where were written, in 1164, the 'Constitutions of Clarendon,' defining the limits between the jurisdiction of the civil and ecclesiastical courts. Henry II called together the bishops and barons of his kingdom and they held council at Clarendon.

CLARENDON, Vt., town in Rutland County, on the Rutland Railroad, noted for its medicinal springs, the waters of which are of value in the treatment of kidney, liver and skin diseases. Its industries are fruit-raising, dairying and maple-sugar making. It is governed by an annual town-meeting. Pop. 857.

CLARENDON, Colony of. This title represents a repeated effort to found the settlement near the mouth of Cape Fear River, N. C., later flourishing as Wilmington. If successful from the outset, it would have been a counterpart of Albemarle (N. C.), and Ashley River (S. C.), and very likely given us a State of Middle Carolina under some name. The first colony was of New Englanders, in 1660: they had trouble with the Indians and abandoned the place by 1663, leaving a post with a placard on it highly disparaging to the region. Early in October 1663, however, the river was explored for 150 miles by Sir John Yeamans, a Cavalier adventurer from Barbadoes. He was delighted with the country, cared nothing for other people's opinions of it, and asked the lords proprietors of Carolina for a grant. They gave it, made him governor of it, and in May 1665 he returned with several hundred settlers from Barbadoes. But Yeamans had wider interests and could not stay with the colony — from 1672 to 1674 he was governor of Carolina; trade was insufficient for more than the northernmost and southernmost settlements; and Clarendon (so named from the famous Lord Clarendon, one of the proprietors) was gradually abandoned, ending with 1690.

CLARENDON, Constitutions of, a code of laws limiting the fields of ecclesiastical and secular power in the courts of England, adopted in the reign of Henry II (January 1164), at a council of prelates and barons held at the village of Clarendon, in Wiltshire. These laws, finally digested into 16 articles, were brought forward by the king as «the ancient customs of the realm,» and were enacted as such by the council. They consisted, however, partly at least, of reforms introduced by the king himself. Ten of the articles were condemned and six allowed by Pope Alexander III. The six articles approved of were of comparatively slight importance, mostly confirming the privileges of the ecclesiastical order; among the condemned articles the most important were the first, providing that disputes between laymen and ecclesiastics as to advowsons should be tried in the King's Court; third, that ecclesiastics accused of any offense against justice should be answerable to the civil courts for the civil offense, and to the ecclesiastical courts for the ecclesiastical offense; fourth, that ecclesiastical dignitaries should not go out of the kingdom without the king's leave; eighth, that appeals should be made from the court of the archbishop to the King's Court, and should not go further (that is, to the Pope) without the king's consent; ninth, that in the event of a dispute between a layman and an ecclesiastic as to whether the civil or ecclesiastical court should have jurisdiction in certain cases of tenure of property, the tribunal should be determined by the king's chief justice upon a recognition of 12 lawful men; 12th, that pleas of debt should belong to the king's jurisdiction. Notwithstanding the entreaties of the other prelates, and in defiance of the king, Becket, after a momentary appearance of yielding, peremptorily refused his signature to the articles. After the murder of the archbishop, the king, on his reconciliation with the Pope in 1172, was compelled to promise the abolition of all laws and customs hostile to the clergy; and at the Council of Northampton in 1176 the constitutions of Clarendon were materially modified in favor of the ecclesiastical order, although some of them remained permanent gains to the civil power. Consult Stubbs, ‹The Constitutional History of England› (Vol. I, Oxford 1896); Pauli, ‹Geschichte von England› (Gotha 1853–58); and for the text of the «Constitutions,» Stubbs, ‹Select Charters Illustrative of English Constitutional History› (7th ed., Oxford 1890).

CLARENDON PRESS, Oxford, the name by which the press of the University of Oxford is distinguished. In January 1586 delegates *de impressione librorum* were appointed by the Convocation of the University. About this time Joseph Barnes was styled «Printer to the University,» and others bore the title after him. In 1633 Archbishop Laud procured letters patent granting a large license in printing to the university, with a view to the publication of manuscripts from the Bodleian Library. The work was carried on from 1713 to 1830 in the building known as the Clarendon, the cost of which was defrayed partly from the sale of Lord Chancellor Clarendon's ‹History of the Rebellion,› the copyright of which was given to the university. The management of the printing office is committed to a board consisting of the vice-chancellor and 10 other members of Convocation, nominated by the vice-chancellor and proctors, as vacancies occur. Five are perpetual delegates and five are nominated for a term of seven years. The south side of the present building (the additional accommodation required and opened) is appropriated to the printing of Bibles and prayer-books. The north, called the «learned» or «classical» side is assigned for the printing of university documents, books printed by authority of the delegates and those sent in by private authors and publishers. Those printed for the university itself (but no others) bear on the imprint «E Typographeo Clarendoniano,» or «At the Clarendon Press.» Some admirable specimens of typography have been produced by the Clarendon Press. It has now an American branch.

CLARENS, klä-rän̄, Switzerland, a village in the canton of Vaud, on the northeastern coast of Lake Geneva, about 50 miles from Geneva and 1,200 feet above sea-level. The healthfulness of the climate and the beauty of the place make it a resort for invalids. It is the scene of Rousseau's ‹Nouvelle Héloise.›

CLARES, Poor. See CLARE, SAINT; ORDERS, RELIGIOUS.

CLARET, a name originally given to wines of a light-red color, but now applied to the red wines imported from France, chiefly from Bordeaux. These wines vary in composition according to the locality, season and age, but the produce of each vineyard usually retains its own peculiar characteristics. The most esteemed are those produced at the vineyards of Lafitte, Latour, Chateau Margaux and others. Many of the clarets formerly sold in the United States were nothing more than the *vin ordinaire* used by the French peasants and working classes, but since the development of the California grape industry as good domestic claret can be obtained here as anywhere. A genuine claret should contain from 10 to 12 per cent of proof spirit.

Fictitious clarets were sometimes prepared by mixing a rough cider with a cheap French wine and coloring with cochineal, logwood, elderberry, hollyhock, indigo, litmus, red cabbage, beet-root or ros-aniline. To detect these coloring matters the following method may be adopted: Make a jelly by dissolving five grams of gelatine in 100 cubic centimeters of warm water and pour it into a square flat mold. From this cake of jelly cubes about three-fourths of an inch square are cut with a sharp, wet knife and are immersed in the wine; they are taken out after 24 to 48 hours, washed slightly and sections cut in order to see how far the coloring matter has penetrated. If the wine is pure, the color will be confined to the edges of the slice, or will not have penetrated more than an eighth of an inch. The coloring matters mentioned above permeate rapidly and color the jelly.

CLARETIE, klär-tē', **Arsène Arnaud,** called **Jules,** zhül, French novelist and dramatist: b. Limoges, 3 Dec. 1840; d. 1913. He studied at the Lycée Bonaparte of Paris and became known as a feuilletonist and dramatic critic. During the Franco-Prussian War he acted as correspondent for Paris papers for a brief period. He wrote a long series of very successful novels, the most noteworthy of them being ‹Madeleine Bertin› (1868); ‹The Million› (1882); ‹Monsieur the Minister› (1882); ‹Noris, Manners of the Time› (1883); ‹The American Woman› (1892). He wrote also some striking chapters of contemporary history, as ‘The Revolution of 1870–71’; ‘Paris Besieged’; ‘Five Years After: Alsace and Lorraine since Annexation.’ His dramatic compositions relate mostly to the time of the great Revolution. He became administrator of the Comédie Française in 1885, and was chosen member of the Academy in 1888. Among his critical works are ‘La vie moderne au théâtre’ (1868–69); ‘Molière’ (1871); and ‘Histoire de la littérature française’ (1905).

CLARIBEL. (1) The bride of Phaon, as told in Spenser's ‘Faerie Queene.’ Philemon endeavors to injure her by false stories to which Phaon gives credit and kills Claribel. When he learns of the deception he murders Philemon. (2) A poem by Tennyson.

CLARIBEL, Sir, a knight who figures in Spenser's ‘Faerie Queene.’ One of four knights who fight for the false Florimel. Bretomart enters the combat with them; Arthur ends the fray, as it is «stinted» by him.

CLARIFICATION, the separation of the insoluble particles that prevent a liquid from being transparent. It may be performed by depuration, filtration or coagulation. In the first of these operations the liquid is permitted to subside, without being in the least disturbed, until all the particles which were in suspension are precipitated; it is then decanted. This mode of clarification can be used only when the substance operated on is in a large quantity, or is of a nature not to be altered during the time necessary to complete the operation, and when its specific gravity is less than that of the particles which render it turbid. Filtration is a process by which a liquid is strained through a body, the interstices of which are small enough to stop the solid particles contained in it. Filters of wool, linen, paper, powdered glass, sand or charcoal may be used, according as the liquid is more or less dense, or of a nature to operate upon any one of these bodies. Clarification by coagulation is performed with the assistance of albumen (as isinglass or white of eggs) added to the liquor for this purpose, which, by the action of heat, of acids, etc., becomes solid, forms a mass and precipitates the extraneous substances. Clarification is also now commonly effected by centrifugal machines.

CLARINDA, Iowa, city, county-seat of Page County; situated on the Nodaway River, 79 miles southeast of Council Bluffs and the Chicago, B. and Q. Railroad, and is 45 miles east of the Missouri River. It is surrounded by an agricultural and stock-raising country and contains carriage factories, brick works, flour-mills, iron works and two banks. The city exports live stock, poultry, butter, eggs, seeds, grain and coal. Valuable coal beds are near the city; also a State asylum for the insane. Pop. 4,000.

CLARINET, or **CLARIONET,** a wood-wind musical instrument with a single vibrating reed, a cylindrical tube and a trumpet-formed mouth. It is played by means of 18 holes, of which 13 have keys. Its scale, though including every semitone within its extremes, is virtually defective. Its lowest note is E below the F clef, from which it is capable, in the hands of good performers, of ascending more than three octaves sharply divided into four distinct qualities of tone characterized by clearness. The name is derived from *clarinetto* or *clarion,* signifying clarity of tone. Its powers through this compass are not everywhere equal; the player, therefore, has not a free choice in his keys, being generally confined to those of C and F, which indeed are the only keys in which the clarinet is heard to advantage. The music for this instrument is therefore usually written in those keys. There are, however, B flat clarinets, A clarinets, D clarinets, B clarinets and G clarinets; the three latter are not ordinarily used.

CLARION, Pa., borough and county-seat of Clarion County, 100 miles northeast of Pittsburgh, on the Clarion River and the Pennsylvania Southern Railroad. Oil, lumber and natural gas are produced in large quantities in the neighborhood. The borough has coal works, cigar factories and bottle factories, also a county courthouse and a State normal school. The borough was settled in 1839 and incorporated two years later. It is governed by a burgess and a borough council, the former being chosen for a three-year term. Pop. 2,900.

CLARION, a musical instrument of the trumpet kind, with a narrower tube and a higher and shriller tone than the common trumpet.

CLARISSA FURIOSA, a story by W. E. Norris, first published in 1896. It may be regarded in the light of a satire on the «New Woman,» and is perhaps the least successful of the clever author's novels. The most of the story is taken up with the semi-public life to which the heroine devotes herself after she has separated from her husband. The workmanship is good, but the writer's want of genuine interest in his characters is felt.

CLARISSA HARLOWE. ‘Clarissa Harlowe’ is the novel upon which rests the fame of Samuel Richardson. As originally published, it consists of seven volumes, which appeared in instalments; the first two volumes in November 1747, the third and fourth in April 1748, and the fifth, sixth and seventh in the following December. The great length was occasioned in part by the form of narrative which the author adopted in this as well as in his other novels. Though Richardson was not the first novelist to make a free use of letters, he was the first one to weld several groups or series of letters into a coherent whole. And yet, in the ordinary sense, Richardson has no story. He takes a simple situation, which he carefully elaborates and then works out in minute detail. Clarissa is the daughter of a country squire, still in her teens, whom her family try to force into marriage with a man whom she loaths. In her dilemma she places herself under the protection of Lovelace, a libertine, whose character she suspects but does not fully know, and flees with him to London. Her professed lover betrays her by the basest act of treachery. Clarissa dies of a broken heart, and Lovelace expiates his crime in a mortal duel. This is all there is to ‘Clarissa Harlowe’ as a story.

It is the workmanship — the sure and certain hand manipulating a multitude of emotional incidents — that interests the reader of the novel. Richardson records Clarissa's emotions from day to day, and from hour to hour, in her distressful situation. One can almost hear her heart beat. There are two volumes depicting her state before she elopes, and a volume is necessary to describe her death. The result is a wonderfully realistic effect. People wrote and talked about Clarissa as if she really lived in the flesh, and they sought out the places associated with her name. While the novel was in progress, men and women, some of them unknown to the author, wrote to him, pleading that he should save the heroine from the fate they feared was impending; but he disregarded their remonstrance and let the tragedy move on to the inevitable end. There emerges a young woman of exalted character, beautiful and amiable, who, being smudged by a villain, prefers death to life. 'Clarissa Harlowe' has become in our literature a type of pure womanhood, and Lovelace the type of the arrant villain, whose virtues — and he has many — are completely eclipsed by one shameless vice.

The novel, at once translated into several languages, created a sensation throughout western Europe. On its plan hundreds of novels have been written in England, France and Germany. From it derive, for example, Mackenzie's 'Man of Feeling,' Rousseau's 'La Nouvelle Héloise,' and, through Rousseau, Goethe's 'Sorrows of Werther.' To Mrs. Klopstock, over in Germany, 'Clarissa' was a "heavenly book"; and Diderot, the French philosopher, placed it on his shelf by the side of Homer, Euripides, Sophocles and the Bible. A Dutch clergyman doubted not that certain parts of the novel, if found in the Bible, would be pointed out "as manifest proofs of divine inspiration." Macaulay claimed to know it almost by heart, and Alfred de Musset pronounced it "le premier roman du monde." Of course many readers have not felt this enthusiasm, and the novel has been called tedious, overwrought and sentimental. It is indeed difficult for anyone, not psychologically inclined, to maintain an interest in an emotional study where for pages nothing may happen more exciting than domestic incident. Lady Mary Wortley Montagu, though she admitted that Richardson described a squire's household as it was, thought the novel on the whole a strange performance; and Horace Walpole called it a picture of "high life as conceived by a bookseller," and a romance as it would be "spiritualized by a Methodist teacher." More recently, the late W. E. Henley denounced Richardson and all his ways as immoral. To say the truth, the fame of 'Clarissa' has deservedly suffered much abatement in popular esteem. Nor is Richardson any longer the model for the novelist. The fact, however, remains that he wrote a great book — the first complete fictitious biography of a woman; and he was master of an art so natural and perfect that he impressed her on the world as a real woman who once lived and suffered martyrdom for her sex. In the fine words of Mrs. Barbauld, Richardson's first biographer, we see in the character of Clarissa "that virtue is triumphant in every situation; that in circumstances the most painful and degrading, in a prison, in a brothel, in grief, in distraction, in despair, it is still lovely, still commanding, still the object of our veneration."

WILBUR L. CROSS,
Professor of English, Yale University.

CLARK, Abraham, American patriot: b. Elizabethtown, N. J., 15 Feb. 1726; d. Rahway, N. J., 15 Sept. 1794. He studied for the bar and practised in his native State with success. After serving as sheriff of Essex County, he was chosen a delegate to the Continental Congress in 1775 and signed the Declaration of Independence. He was a member of the Continental Congress 1776–78, 1780–83 and 1785–88, 1791–94; of the Constitutional Convention of 1789, and aided in framing the Constitution of the United States.

CLARK, Albert Curtis, English classical scholar: b. Salisbury, 21 Feb. 1859. He was educated at Balliol College, Oxford, was fellow of Queen's College 1882, lecturer 1882–87 and tutor 1887–1913. Since 1913 he is Corpus Christi professor of Latin at Oxford. His publications are 'Collations from Harleian MS. of Cicero 2682' (1891); Cicero's 'Pro Milone, Cæsarianæ, Philippicæ' (1900); 'The Vetus Cluniacensis of Poggio' (1903); 'Inventa Italorum' (1909); 'Fontes Prosæ Numerosæ' (1909); 'Cursus in Mediæval and Vulgar Latin' (1910); 'Prose Rhythm in English' (1913); 'The Primitive Text of the Gospels and Acts' (1914); 'Recent Developments in Textual Criticism' (1914). He edited the Oxford 'Cicero.'

CLARK, Alonzo Howard, American scientist: b. Boston, 13 April 1850. He left his studies at Wesleyan University to enter the service of the United States Fish Commission, making a thorough study of the work. In 1889 he was sent as expert commissioner to the Paris Exposition of that year. From 1889 to 1908 he was assistant secretary of the American Historical Association. He has written 'History of Fish Industries of the United States'; 'Whales and Sea Fisheries'; 'History of the Mackerel Fisheries'; 'Food Industries of the World'; 'Statistics of Fisheries of Massachusetts' (1882); 'History of Mackerel Fishery' (1883); 'National Register of the Society of the Sons of the American Revolution' (1902).

CLARK, Alvan, American astronomical-instrument maker: b. Ashfield, Mass., 8 March 1808; d. Cambridge, Mass., 19 Aug. 1887. He was at one time a portrait painter in Boston; but in 1844 his attention was turned to telescope making. Two years later he definitely adopted the business of astronomical-instrument making and in time achieved a world-wide reputation. His famous telescopes include the Chicago 18½-inch, the Washington 26-inch, the Russian 30-inch and the California 36-inch. Consult 'Proceedings of the Royal Astronomical Society' (Vol. XVII, London).

CLARK, Alvan Graham, American astronomer: b. Fall River, Mass., 10 July 1832; d. Cambridge, Mass., 9 June 1897. He was a son of Alvan Clark (q.v.), and became associated with him under the firm name of Alvan Clark & Sons. In 1859 they began work on an object glass with an aperture of 18½ inches, which ultimately became the property of the Astronomical Society of Chicago. With this instrument Clark discovered the companion of Sirius, for which the French Academy awarded him the Lalande medal. Other telescopes constructed largely under his supervision were that for the Naval Observatory, a 26-inch instrument with which Prof. Asaph Hall discovered the two satellites of Mars; the McCormick telescope for the University of Virginia; the great 30-inch one for the Saint Petersburg Imperial Observatory; the powerful Lick telescope, with an aperture of 36 inches, at Mount Hamilton, Cal. (1886), with which Jupiter's fifth satellite was discovered; and, finally, the greatest of his achievements as a maker, the wonderful Yerkes lens of 40 inches, the gift of C. T. Yerkes to the University of Chicago, and installed in the observatory at Lake Geneva, Wis. As an astronomer he made several discoveries of double stars. See Telescope, Construction.

CLARK, Sir **Andrew,** Scotch physician: b. Aberdeen, 28 Oct. 1826; d. London, 6 Nov. 1893. He was educated at Aberdeen and Edinburgh. After an unusually brilliant career as a student of medicine at Edinburgh, he assisted Dr. Hughes Bennett and Dr. Robert Knox, the anatomist; had charge for four years of the pathological department at the Haslar Naval Hospital; curator of the museum of the London Hospital (1853), and assistant physician there (1854). After 1854 he became associated with the College of Physicians, becoming an officer of that body and president in 1888. He had a large practice in London, and wrote on many subjects, especially tuberculosis. He will live in remembrance as the «beloved physician» of George Eliot.

CLARK, Champ, American statesman: b. Lawrenceburgh, Anderson County, Ky., 7 March 1850. In his own biography he gives his early life: «Worked as a hired hand, clerked in a country store, edited a country newspaper and finally practised law.» He was graduated at Bethany College A.B. 1873, and at the Cincinnati Law School LL.B. 1875. He was president of Marshall College, West Virginia, 1873–74; was admitted to the Missouri bar in 1875, and practised in Bowling Green, Mo., from 1880. He was city attorney of Louisiana, Mo., and Bowling Green, Mo., 1878–81; presidential elector in 1880; prosecuting attorney in Pike County, Mo., 1885–89; representative in the State legislature of Missouri, 1889–91; representative from the 9th district of Missouri in the 53d Congress, 1893–95; was defeated for the 54th Congress by a music teacher at a time when Missouri sent 11 Republicans to Congress, and elected from the 9th district of Missouri to the 55th and successive Congresses, including the 64th Congress. He served on the House Committee on Foreign Affairs, and on the Committee on Ways and Means. He served as vice-president for Missouri in the Trans-Mississippi Congress, held at Denver, Colo., in May 1891, and was permanent chairman of the Democratic National Convention of 1904; and chairman of the committee to notify Judge Alton B. Parker of his nomination for the Presidency. He was minority leader in the second session of the 60th and 61st Congress, and was elected speaker of the House of Representatives of the 62d, 63d and 64th Congresses. In 1912 he was the leading candidate for the Democratic nomination for President at the National Convention at Baltimore, leading on 29 ballots and receiving a clear majority on nine ballots, but was defeated by Governor Wilson of New Jersey.

CLARK, Charles Edgar, American naval officer: b. Bradford, Vt., 10 Aug. 1843. He entered the naval service in 1860; took part in the battle of Mobile Bay and in the bombardment of Fort Morgan, and was promoted captain in 1896. In March 1898 he took command of the battleship *Oregon* at San Francisco, and when war with Spain was deemed inevitable, received orders to proceed to Key West, Fla., with all haste. After a voyage of over 14,000 miles he joined the American fleet in Cuban waters on 26 May, and on 3 July commanded his ship at the battle of Santiago. In March 1899 he was assigned to duty at the League Island navy yard; was promoted rear-admiral 16 June 1902, and retired 9 Aug. 1905. He wrote ‘My Fifty Years in the Navy’ (1917).

CLARK, Charles Heber («Max Adeler»), American journalist: b. Berlin, Md., 11 July 1841; d. 10 Aug. 1915. In 1865 he entered newspaper work as reporter on *The Philadelphia Inquirer.* In 1865 became editor of *The Philadelphia Inquirer.* In 1867 became associated with *Philadelphia Evening Bulletin* and later as editor and one of the owners. In 1882 purchased the *Textile Record* and edited it until 1903. From 1887 to 1897 he edited *The Manufacturer.* He wrote much on economic themes, but was best known to the general public as a humorist under the pseudonym, Max Adeler. He published ‘Out of the Hurly Burly’; ‘Random Shots’; ‘Elbow Room’; ‘The Fortunate Island’; ‘Captain Bluitt’ (1902); ‘In Happy Hollow’; ‘The Quakeress’; ‘By the Bend in the River.’

CLARK, Charles Hopkins, American newspaper editor: b. Hartford, Conn., 1 April 1848. He was graduated at Yale in 1871 and since that year has been connected with the Hartford *Courant,* the oldest newspaper continuously published in America. After 1890 he was editor-in-chief. He has served as president and director of important corporations and since 1909 as director of the State Reformatory. In 1910 he became a fellow of the Corporation of Yale University.

CLARK, Charles Kirk, Canadian alienist: b. Elora, Ontario, 1857. He was educated at the University of Toronto and began his medical career under the tutelage of Joseph Workman. He became assistant superintendent of Hamilton and Rockwood hospitals for the insane, then superintendent of Rockwood Hospital for Insane and eventually superintendent of Toronto Hospital for Insane until 1911, when he became superintendent of the Toronto General Hospital. He is also professor of psychiatry at Toronto University and dean of the medical faculty there since 1907. He has done a great deal of medico-legal work in Canada and is one of the authorities on psychiatric matters in the Dominion. He has written many brochures on psychiatric and medico-legal subjects; also many articles on ornithology. He is editor of the *Medical Bulletin* of Toronto University, one of the editors of the *Journal of Insanity* and of the Johns Hopkins *Press.*

CLARK, Clarence Don, American legislator: b. Sandy Creek, N. Y., 1 April 1851. He was educated at Iowa State University and was admitted to the bar in 1874. He practised his profession in Delaware County, Iowa, 1874–81 and at Evanston, Wyo., since 1881. He was a member of the 51st and 52d Congresses (1889–93) from the new State of Wyoming, was United States senator 1895–99 to fill a vacancy and was re-elected in 1899, 1905 and 1911. In the 63d Congress he was chairman of the Committee on Geological Survey.

CLARK, Daniel, Canadian pathologist: b. Grantown, Scotland, 29 Aug. 1836; d. 1912. He went to Canada when a child, graduated at Victoria University in 1858 and practised medicine in Ontario with great success. He was head of the Provincial Asylum for the Insane at Toronto 1875–1905. He was twice president of the College of Physicians and Surgeons of Ontario. He was the author of ‘Pen Photographs’ (1873); ‘Josiah Garth,’ a novel.

CLARK, Edward, American architect: b. Philadelphia, Pa., 1822; d. 1902. He studied architecture under Thomas U. Walter and succeeded the latter as architect of the extension to the United States Capitol in 1865. He was a member of the commission appointed by Congress for the completion of the Washington Monument and of the commission for the construction of the Congressional Library. He was a member of the American Institute of Architects and trustee of the Corcoran Art Gallery, Washington, D. C.

CLARK, Edwin Charles, English jurist: b. Yorkshire, England, 5 Nov. 1835. He was educated at Shrewsbury School and Trinity College, Cambridge. He practised for a short time as a conveyancer in London, being called to the bar at Lincoln's Inn, 1860. From 1872 to 1914 he was Regius professor of civil law at Cambridge. His books are ‘Early Roman Law: Regal Period’ (1872); ‘Analysis of Criminal Liability’ (1880); ‘Practical Jurisprudence: a Comment on Austin’ (1883); ‘Cambridge Legal Studies’ (1888); ‘History of Roman Private Law’ (1906).

CLARK, Francis Edward, American clergyman: b. Aylmer, Quebec, 12 Sept. 1851. Son of Charles G. Symmes, he was orphaned at eight years and adopted by his uncle, Rev. E. W. Clark, whose name he assumed. He was graduated from Dartmouth College in 1873 and continued his studies at Andover Theological Seminary. He became pastor of a Congregational church at Portland, Me., and there organized the first Young People's Society of Christian Endeavor, 2 Feb. 1881. He was pastor of the Phillips Congregational Church in South Boston, Mass., 1883–87, and in 1887 was made president of the United Society of Christian Endeavor; since then he has devoted his time to the Christian Endeavor work as its president and the World's Christian Endeavor Union, and is editor of the *Christian Endeavor World;* has traveled around the world five times in the interests of the work. He is the author of many books and leaflets relating to Christian Endeavor work and to his Christian Endeavor journeys. He has published ‘Our Vacations’ (1874); ‘Life of William E. Harwood’ (1877); ‘Our Business Boys’ (1883); ‘Looking Out on Life’ (1883); ‘Danger Signals’ (1884); ‘Young People's Prayer Meetings’ (1887); ‘Ways and Means’ (1890); ‘Christian Endeavor Saints’ (1890); ‘Our Journey Around the World’ (1894); ‘The Mossback Correspondence’ (1898); ‘The Everlasting Arms’ (1895); ‘World-Wide Endeavor’ (1895); ‘Old Lanterns for New Paths’ (1898); ‘A New Way Around an Old World’ (1900); ‘Training the Church of the Future’ (1902); ‘Christian Endeavor Manual’ (1903); ‘The Gospel in Latin Lands,’ with Mrs. Clark (1909); ‘Old Homes of New Americans’ (1912); ‘The Whole Land of Asia Minor’ (1914); ‘In Christ's Own Country’ (1914).

CLARK, Galen, American naturalist: b. Dublin, N. H., 1814; d. 1910. He engaged in placer mining in California in 1853 and after a few years became a guide to tourists in the Yosemite Valley. In 1857 he discovered the great redwood growth at Maribosa and in 1865 he became guardian of the Yosemite Valley Park. He was succeeded by another, but from 1890 until his death he was again guardian of the park. He was esteemed as an authority on the geology and other natural features of the Sierra Nevada. He wrote ‘The Indians of Yosemite Valley’ (1904); ‘The Big Trees of California’ (1907); ‘The Yosemite Valley, its History, Characteristic Features and Theories as to its Origin’ (1910).

CLARK, George Rogers, American pioneer: b. Monticello, Va., 19 Nov. 1752; d. near Louisville, Ky., 13 Feb. 1818. He studied surveying and at 20 settled in Ohio, serving in the Indian wars of that region. In the spring of 1775 he was employed as deputy surveyor under Captain Lee and removed to Kentucky in 1775. In June 1776 he represented Kentucky in the Virginia legislature. He was soon regarded as the leader of that country, procuring the organization of the Territory and securing the much needed gunpowder for its protection. Governor Patrick Henry gave him the rank of lieutenant-colonel and detailed him to raise troops for the conquest of Illinois. Clark attacked the British post at Kaskaskia and took possession of the French villages up the Mississippi, Cahokia and Vincennes. In 1778 he was promoted to the rank of colonel. In 1780 he proceeded to the mouth of the Ohio and built Fort Jefferson. After receiving the commission of brigadier-general, he attempted to attack Detroit; but the expedition proving unsuccessful, he returned to Kentucky and subsequently founded Fort Nelson on the site of Louisville. His successes in the Northwest, however, saved much territory to the colonies in the final treaty of peace with Great Britain. In 1786, Clark negotiated a treaty with the Shawnees. He then set out to conquer the tribes on the Wabash, but this, too, proved a failure, and he turned his efforts toward supporting the cause of the French of the Mississippi Valley against the Spaniards. He retired to Kentucky in his later years in great penury but was relieved a few years before his death by a grant of 8,049 acres of land in Indiana and an annuity from the Virginia legislature. He wrote two accounts of the conquest of Indiana. Consult English, W. H., ‘Life of George Rogers Clark’ (in ‘Conquest of the Country Northwest of the River Ohio 1778–1783’ (2 vols., 1896); Roosevelt, ‘Winning of the West’ (Vols. I and II, New York 1889); Butterfield, ‘History of G. R. Clark's Conquest of the Illinois and Wabash Towns.’

CLARK, Hubert Lyman, American zoologist: b. Amherst, Mass., 9 Jan. 1870. He was educated at Amherst and at Johns Hopkins University. From 1899 to 1905 he was professor of biology at Olivet College; in 1905–12 he was assistant in invertebrate zoology at the Museum of Comparative Zoology, Harvard, and curator of echinoderms after 1912. He has carried on scientific investigations in Jamaica, Bermuda and Torres Strait, Australia, and published many papers dealing with birds, snakes, echinoderms and flowers.

CLARK, Imogen, American novelist: b. New York. She was educated at Madame da Silva's French and English School and by private tutors. She has published ‘Will Shakespeare's Little Lad’ (1897); ‘The Victory of Ezry Gardner’ (1897); ‘The Heresy of Parson Medlicott’ (1900); ‘God's Puppets’ (1901); ‘Santa Claus' Sweetheart’ (1906); ‘A Charming Humbug’ (1908); ‘We Four and Two More’ (1909); ‘The Robert Collyer Anthology’ (1911); and ‘Rhymed Receipts’ (1912).

CLARK, Isaac, American theologian: b. Canterbury, Conn., 30 June 1833. He was graduated at Yale in 1856, studied at the Union Theological Seminary 1858–59 and was graduated at the Andover Theological Seminary in 1861. He entered the Presbyterian ministry in 1861 and held pastorates at Elmira, N. Y., 1861–68; Aurora, Ill., 1868–72; Brooklyn 1872–74; Rondout 1874–82 and Northampton, Mass., 1882–91. After 1891 he was professor of theology, homiletics and English exegesis, and after 1901 dean of the School of Theology of Howard University.

CLARK, Sir James, Scottish physician: b. Cullen, Banffshire, 14 Dec. 1788; d. Bagshot Park, 29 June 1870. He studied law at Aberdeen, receiving his M.A.; and then medicine at the University of Edinburgh, and entered the navy as assistant surgeon in 1809, and continued in the service till 1815, when he returned to Edinburgh. After devoting some time to foreign travel, he settled in Rome, where he continued to practise from 1819 to 1826. He returned to England in 1826, and became physician to the Duchess of Kent in 1835, and on the accession of Queen Victoria was appointed first physician in ordinary to the queen, and shortly afterward made a baronet. He retired from practice several years before his death, but continued till near the close of his life to act as consulting physician to the royal family. Soon after his return to England Sir James Clark published, as a result of his continental observations, a work ‘On the Sanative Influence of Climate’ (1829), and a ‘Treatise on Pulmonary Consumption and Scrofula’ (1835).

CLARK, John Bates, American economist: b. Providence, R. I., 26 Jan. 1847. He was graduated at Amherst in 1872, and studied also at Heidelberg and Zürich. He was appointed professor of economics and history at Carleton College 1877, at Smith College in 1882 and at Amherst in 1893. He was lecturer on economics at Johns Hopkins University 1892–94, and president of the American Economic Association 1893–95. He has been professor of economics at Columbia since 1895. In 1911 he was appointed director of the division of economics and history of the Carnegie Endowment for International Peace. He is a member of the Royal Swedish Academy of Arts and Sciences. He has received the following honorary degrees: Ph.D. and LL.D. from Amherst; LL.D. from Princeton; LL.D. from the University of Christiania. He has published the following works: ‘The Philosophy of Wealth’ (1885); ‘Capital and Its Earnings’ (1888); ‘Wages’ (1889); ‘The Distribution of Wealth’ (1901); ‘The Control of Trusts’ (1901); ‘The Problem of Monopoly’ (1904; revised, in collaboration with John Morris Clark, 1912); ‘Essentials of Economic Theory’ (1907), and numerous articles in scientific periodicals and monographs on economic subjects. Professor Clark occupies the first place among American economists. The distinguishing features of his economic theory are his distinction between the static and dynamic forces in economic life and a final productivity theory of wages and interest.

CLARK, John Emory, American scientist: b. Northampton, N. Y., 8 Aug. 1832. He was prepared for college at the Troy Conference Academy of West Poultney, Vt., and entered the University of Michigan, where he was graduated with the degree of Bachelor of Arts in 1856. The degree of Master of Arts followed in 1859. He was professor of mathematics in the Michigan State Normal School 1856–57, and assistant professor of mathematics in the University of Michigan 1857–59. During the year 1859–60 he studied at the universities of Heidelberg, Munich and Berlin. From 1861 to 1862 he was a United States deputy surveyor in Dakota. In August 1862 he entered the Union army as captain of the 5th Michigan Cavalry. On 3 July 1863 he was promoted to the rank of major, and was honorably discharged 25 Feb. 1865. On 13 March 1865 he was made brevet lieutenant-colonel, United States Volunteers. In 1866 he returned to teaching, and was professor of mathematics and physics, and, after one year, of mathematics and astronomy, in Antioch College, Ohio, till 1872. In the summer and fall of 1869 he again served the government as deputy surveyor in Colorado, and in the summer and fall of 1872 he was assistant astronomer to the United States Northern Boundary Commission. The latter part of the academic year 1872–73 he was instructor in mathematics in the Sheffield Scientific School of Yale University, and in June 1873 was appointed professor of mathematics in that institution. He held that position till June 1901, when on account of impaired health he resigned his chair and was made professor emeritus.

CLARK, Jonas Gilman, American philanthropist: b. Hubbardston, Mass., 1 Feb. 1815; d. Worcester, Mass., 23 May 1900. He began life as a carriage maker and acquired a fortune in business and real estate investments. He is noted as the founder of Clark University (q.v.), at Worcester, Mass., which he endowed with $2,000,000 in 1887. He also conferred gifts on his native town. He bequeathed $200,000 to Clark University outright and $1,000,000 and the residue of his estate conditionally.

CLARK, Joseph, English painter: b. Cerne Abbas, Dorsetshire, 4 July 1834. He was educated by William Barnes, «The Dorset Poet» (q.v.), went to London at 18 and became a student at the Royal Academy. He first exhibited at the Royal Academy in 1857, and has exhibited there nearly every year since. Among well-known pictures by him are 'The Return of the Runaway'; 'Hagar and Ishmael'; 'Three Little Kittens.'

CLARK, (Josiah) Latimer, English engineer: b. Great Marlow. He invented a gutta-percha coating for underground wires and the "Clark cell." He also made valuable investigations in regard to electric currents in submarine cables. He invented a submarine cable covering of asphalt, hemp and silica, and was engineer in charge of the laying of several submarine cables. He published 'An Elementary Treatise on Electrical Measurement' (1868); 'Electrical Tables and Formulæ' (1871); 'Dictionary of Metric and Other Measures' (1891); 'Memoir of Sir W. F. Cooke' (1895).

CLARK, Kate Upson, American journalist and editor: b. Camden, Ala., 22 Feb. 1851. She was graduated at Wheaton College in 1869 and from the Westfield (Mass.) Normal School 1872. She was married to Edward Perkins Clark in 1874 (d. 1903). In 1872–73 she taught in the Central High School, Cleveland. She has edited many periodicals and departments and has lectured on literary, educational and domestic topics. She is a contributor to *St. Nicholas, Youth's Companion, Atlantic Monthly* and other magazines. She published 'Bringing Up Boys' (1900); 'White Butterflies' (1900); 'How Dexter Paid His Way' (1901); 'Move Upward' (1902); 'Up the Witch Brook Road' (1902); 'The Dale Twins' (1906); 'The Adventures of Spotty' (1907); 'Donald's Good Hen' (1907); 'Art and Citizenship' (1907).

CLARK, Lewis Gaylord, American journalist and humorous writer: b. Otisco, N. Y., 5 March 1810; d. Piermont, 3 Nov. 1873. In 1834 he became editor of the *Knickerbocker Magazine,* and with Irving, Bryant, Longfellow, Halleck and Willis as contributors, made it the foremost literary publication of that time, and an inspiration to a higher standard of periodical literature. 'The Editor's Table,' written by him, overflowed with amusing stories and witty sayings. It was discontinued because of lack of funds in 1859. He was assisted out of his pecuniary difficulties by the sale of 'The Knickerbocker Gallery,' a book compiled by former contributors to the magazine. The 'Knickerbocker Sketch-Book' (1850) and 'Knick-Knacks from an Editor's Table' (1853) are his only publications in book form.

CLARK, Marcus, Australian novelist: who produced in 'For the Term of His Natural Life,' a powerful problem novel dealing with the convict system over which there was strong agitation in Australia in 1837–38; and also in England, where it was shown that the convict system was then costing the country about £500,000 a year without any adequate advantage to England herself and that the evil done to the convicts was untold. In his novel Marcus Clark showed up these conditions so vividly that he found his audience as wide as the English-speaking world.

CLARK, Michael, Canadian legislator: b. Belford, Northumberland, 12 May 1861. He was educated for the medical profession at Edinburgh University, and practised in England for some years. While in practice, he took a lively interest in public affairs, was a member of the school board of Newcastle-on-Tyne and took the unpopular course of denouncing on public platforms the policy that led up to the South African War of 1899–1902. He emigrated to western Canada in 1902 and engaged in ranching and farming in Alberta. In 1908 he was returned to the Dominion House of Commons in the Liberal interest, and was re-elected in 1911. As a strong free-trader, he occupies a somewhat unique place in parliamentary life. After the outbreak of the Great War in 1914 he gave a steady support to the Borden administration in the measures which were deemed necessary to carry through Canada's part in the world conflict. He supported the compulsory service measure of the government in 1917 and voted against the referendum on that subject proposed by his party leader, Sir Wilfrid Laurier. His pungent and somewhat unsparing criticisms of Sir Wilfrid's attitude, while they aroused enthusiasm among the Conservatives, were hotly resented by the majority of his own party. It had been his intention to resign from Parliament at the general election of 1917, but the announcement that he would accept nomination in his riding if a party fight were avoided was followed by the withdrawal of the Conservative candidate. He is one of the most incisive debaters in the House and one of the best platform speakers in the Dominion.

CLARK, Thomas March, American Protestant Episcopal bishop: b. Newburyport, Mass., 4 July 1812; d. 7 Sept. 1903. He was graduated at Yale in 1831, and four years later entered the Presbyterian ministry, but in 1836 took orders in the Episcopal Church. He was successively rector of Grace Church, Boston (1836–43); Saint Andrew's, Philadelphia (1844–47); Trinity Church, Boston (1847–51); and Christ Church, Hartford, Conn. (1851–54). In the year last named he was consecrated bishop of Rhode Island. From 1899–1903 he was the presiding bishop of the Episcopal Church. He has written 'Formation of Character'; 'The Efficient Sunday-school Teacher'; 'The Dew of Youth'; 'Early Discipline and Culture'; 'Reminiscences' (1895).

CLARK, Victor Selden, American economist: b. Portageville, N. Y., 12 June 1868. He was educated at the universities of Minnesota and Chicago and in 1892–93 studied at Göttingen and Bern. In 1893–97 he was high school principal and superintendent in Minnesota. He was superintendent of public instruction and president of the Insular Board of Education of Porto Rico under the military government. In 1902–09 he was engaged in investigating foreign and insular labor conditions for the United States government. In 1910 he was placed in charge of the census of Hawaii and in 1910–13 was commissioner of immigration, labor and statistics for the Territory of Hawaii. He resigned to resume active charge of the division of manufactures and economic history at the Carnegie Institute. He has published 'Education in Porto Rico' (1902); 'Labor Conditions in Cuba' (1902); 'Labor Conditions in Hawaii' (1903–15); 'Labor Conditions in Mexico’ (1908); ‘Canadian Industrial Disputes Act’ (1909); ‘Women and Children Wage Earners in Great Britain’ (1908); ‘History of American Manufactures’ (1915).

CLARK, Walter, American jurist: b. Halifax County, N. C., 19 Aug. 1846. A.B., University of North Carolina 1864, A.M. 1867, LL.D. 1888. He became lieutenant-colonel in the Confederate States army 1864, at 17 years of age, being the youngest officer of this rank in either army; was admitted to the bar in 1868; judge of the Superior Court of North Carolina 1885–89; judge of the Supreme Court 1889–1902; chief justice since 1 Jan. 1903. He is the author of ‘Annotated Code of Civil Procedure’ (3d ed.); translated from the French Constant’s ‘Memoirs of Napoleon’ (3 vols., 1895); compiled and edited ‘North Carolina State Records’ (16 vols., 1894–1907); ‘Histories of North Carolina Regiments 1861–65’ (5 vols.); also issued reprints of 164 volumes of ‘North Carolina Supreme Court Reports’ with annotations; edited article “Appeal and Error” in ‘Cyclopedia of Law and Procedure’; is a contributor to magazines.

CLARK, Walter Eli, American public official: b. Ashford, Conn., 7 Jan. 1869. He was graduated at Wesleyan University in 1895 and became in the same year a reporter on the Hartford *Post.* In 1897 he was Washington correspondent to the New York *Commercial Advertiser,* and in succeeding years was Washington correspondent for several important journals. In 1909 he was made governor of Alaska by President Taft and remained in that office until 1913. He has contributed articles to magazines and weekly periodicals.

CLARK, William, American explorer: brother of George Rogers Clark (q.v.): b. Virginia, 1 Aug. 1770; d. Saint Louis, Mo., 1 Sept. 1838. He emigrated with his family at the age of 14 to the falls of the Ohio, in Kentucky, on the present site of Louisville. In 1808 he was appointed, in conjunction with Capt. Meriwether Lewis (q.v.), to the command of an expedition designed to explore the northwest territory lying between the Mississippi and the Pacific Ocean. He acquitted himself with consummate ability in this hazardous employment, which required the combination of military and scientific skill. His journal and the account kept by him of the astronomical observations made by him and Captain Lewis have been published. He was appointed in 1813 governor of the Northwest Territory and superintendent of Indian affairs, which offices he retained till 1820, when Missouri was created a State. Two years afterward he was again appointed commissioner and superintendent of Indian affairs. See LEWIS AND CLARK EXPEDITION.

CLARK, William Andrews, American business man and politician: b. near Connellsville, Pa., 8 Jan. 1839, of Scotch-Irish parentage. He had a common school education and was preparing for college which was interrupted by the removal of his family to Iowa. In that State he attended an academy at Birmingham and later spent a year in the Wesleyan University at Mount Pleasant, Iowa, where he also studied law. He afterward taught school in the State of Missouri, 1858–60. In the spring of 1862 he drove a team from Atchison, Kan., to South Park, Colo., and then worked in the mines at Central City, Colo., for nearly a year. In 1863 he migrated to Grasshopper Mines, a new discovery in eastern Idaho, which afterward became a part of the State of Montana, where he mined two years in the placer diggings. He later formed a copartnership in a large mercantile and banking business, in which he had a minor interest, which continued until 1872, when he sold his interest in the mercantile business and organized the First National Bank of Deer Lodge, Mont., of which he became president. He has continued in the banking business up to the present time, being now senior member of the firm of W. A. Clark & Brother at Butte, Mont. In 1872 he first visited the mining camp at Butte, Mont., where he made some purchases, and has ever since that time been interested in large mining operations. In order to qualify himself for this business in the winter of 1872–73 he took a special course in the Columbia School of Mines. His mining interests were afterward enlarged until at the present time he is owner of large mining interests in Montana, Idaho, Utah, Nevada and Arizona, where he is the principal owner of the famous United Verde Copper Company’s mines, and is now the largest individual producer of the different metals in the United States, and probably the entire world. In connection with Mr. E. H. Harriman he built the railroad extending from Salt Lake City to Los Angeles and San Pedro Harbor. A unique feature of this transaction was that no bonds were ever sold. The road was built from cash furnished by the principals, and this is now one of the leading railroad interests in the western country. He was appointed by the governor to represent Montana as State orator at the Philadelphia Centennial Exposition of 1876, and was also appointed a commissioner of the New Orleans Exposition in 1884. He was grand master of Masons in Montana in the years 1877–78. He was appointed by the governor as major of a battalion of volunteers at the time of the invasion of the Nez Percés Indians, who were led by Chief Joseph. In 1884 at the formation of the first Constitutional Convention of Montana he was elected president. In 1898 a second convention was called, of which he was likewise elected president, and under the constitution then framed Montana was admitted into the union of States. In 1898 he was elected by the State legislature as senator from Montana, but a protest was filed and an investigation of his election ordered. Before a report was made he resigned and returned to Montana where the question was decided by the people of his State and he was re-elected by a large majority in the year 1901 and served a full term in the Senate. He was placed on important committees and was a member of the Committee on Foreign Relations. At the close of his term he declined to be again a candidate for re-election and has been continuously engaged in the many industries which are owned and controlled by him.

CLARK, William Bullock, American scientist; b. Brattleboro, Vt., 15 Dec. 1860. He was graduated at Amherst College in 1884. After a course of European study he became instructor in geology at Johns Hopkins University in 1887, and since 1894 has been professor of geology there. In 1891 he was appointed director of the Maryland weather service. In 1896 he was made State geologist of Maryland; in 1900 was appointed commissioner for the State of Maryland on the resurvey of Mason and Dixon's line, and in 1908 was made a member of the Maryland State conservation commission. His publications include a number of interesting papers and reports dealing with subjects of American geology, contributed principally to the volumes of the Maryland geological survey; also 'The Mesozoic and Cenozoic Echinodermata of the United States' (1915).

CLARK, William George, English scholar: b. March 1821; d. York, 6 Nov. 1878. He was educated at Trinity College, Cambridge, whence he was graduated in 1844, becoming elected fellow, tutor and public orator of the university (1857); took orders in the Established Church, but gave up his orders in 1869, explaining his reasons therefor in a pamphlet, 'The Present Dangers of the Church of England' (1870). He visited Spain (1849) and toured Greece (1856.) He published an account of these travels in 'Gazpacho' (1850) and 'Peloponnesus' (1858). He assisted in founding the *Journal of Philology* in 1868, but is best known for his editorship with William Aldis Wright (q.v.) of the noted 'Cambridge Shakespeare' (1863–66). The 'Globe Shakespeare' (1864) was also edited by Clark and Wright. Clark published also 'Lectures on the Middle Ages and the Revival of Learning' as well as lesser works. He left a considerable portion of his property to the college, which was used for the endowment of the Clark Lectureship in English Literature at Trinity.

CLARK, Sir **William Mortimer,** Canadian administrator: b. Aberdeen, Scotland, 24 May 1836; d. Prouts Neck, Me., 11 Aug. 1917. He was educated at Marischal College, Aberdeen, and Edinburgh University; was admitted a writer to the *Signet* in Edinburgh in 1859, and settled in Toronto, Canada, in the same year. He was called to the bar of Ontario in 1869 and became Q.C. in 1880, in which year he was elected chairman of the board of management of Knox College, Toronto, a position he held until his death. He was a senator of the University of Toronto for a number of years and was lieutenant-governor of Ontario (1903–08).

CLARK, William Thomas, American soldier: b. Norwalk, Conn., 1831; d. 1905. He was appointed lieutenant of an Iowa regiment at the opening of the Civil War, and at its close he had reached the rank of major-general. He was chief-of-staff of General Grant's Army of the Tennessee. After the war he settled at Galveston and there he established the first negro school and befriended the black race at considerable risk to himself. In 1869–72 he was in Congress and secured the first appropriation ($100,000) for jetties and other improvements for Galveston harbor.

CLARK FORK, an important fork of the Columbia River, formed by the Flathead and Missoula rivers, Montana. It flows through Lake Pend d'Oreille in Idaho and enters Washington near its northeast corner and flows into the Columbia River on the Canadian frontier. Its length is about 650 miles.

CLARK UNIVERSITY, a coeducational institution in Atlanta, Ga.; organized in 1870 under the auspices of the Methodist Episcopal Church; reported at the end of 1915: Professors and instructors, 40; students, 440; number of volumes in library, 5,000; value of property, $250,000; president, W. W. Foster, D.D.

CLARK UNIVERSITY, Worcester, Mass., founded in 1887 by the gift of Jonas Gilman Clark (q.v.), and the work of instruction began in 1889. At first the institution was devoted wholly to post-graduate work. Those only were admitted as students who had taken a first degree and who gave promise of high attainment in some department of science. No entrance examination was required. The design and organization of the university were entrusted to G. Stanley Hall, formerly a professor of philosophy at Johns Hopkins University, Baltimore, and for years a close observer of schools and school methods in America and Europe. But few departments have been organized, namely, mathematics, physics, anthropology, biology, philosophy and psychology. Pedagogy (1899) was made one of the sub-departments of psychology. One of the characteristic features in the design is that professors and students should meet on the same plane, the professors to be as older students, the students to lecture occasionally on special subjects. Instruction is entrusted in some degree to the fellows and also to the docents, the latter representing the highest academic university appointments. Original work is encouraged and demanded, and a number of fellowships and scholarships have been founded so that worthy students of limited means may devote themselves to research along special lines and not be hindered or hampered by doing outside work for the purpose of continuing their studies. No attempt has been made to secure large numbers of students; in such a school a small number is desirable. In 1892–93 there were 53 students; in 1896–97, 38; in 1898–99, 48; in 1909–10, 110; in 1913–14, 90.

There are 25 professors, 20 fellowships and 10 scholarships. In the library are 65,000 volumes, and the following publications are issued by the university, but not officially: *American Journal of Psychology; Pedagogical Seminary; Mathematical Review.*

Upon the death of Mr. Clark in 1900 the university received a bequest of additional funds for research — $600,000 for a library fund and $150,000 for a library building; $100,000 for an art department, and $1,300,000 for the establishment of an undergraduate department. In 1902 a collegiate department was opened of which Edmund C. Stanford is president. G. Stanley Hall is president of the university. See Hall, G. Stanley.

CLARKE, Adam, Methodist clergyman and scholar: b. Moybeg, County Londonderry, Ireland, 1762; d. London, 26 Aug. 1832. He became an itinerant Methodist preacher in 1782, and continued to travel in various circuits till 1805, when he took up his residence in London, where he passed a considerable part of his subsequent life. He was learned in the Oriental languages and published a commentary on the Scriptures (1810–26), and various other works, among the rest a 'Bibliographical Dictionary'

(1802). Consult the 'Life' by Etheridge (London 1858).

CLARKE, Alexander Ross, English astronomer: b. 1828; d. 1914. He entered the Royal Engineers in 1847, was transferred to the Ordnance Survey in 1850 and retired as lieutenant-colonel in 1881. He was a delegate to the International Geodetic Congress in Rome in 1883 and in 1887 was awarded the Royal medal of the Royal Society. He published the results of two investigations on the figure of the earth and 'Comparisons of the Standards of Length of England, France, Belgium, Prussia, Russia, India, Australia' (1866); 'Determination of the Position of Feaghmain and Haverfordwest' (1867); 'Comparisons of Standards and Lengths of Cubits' (1873); 'Geodesy' (1880).

CLARKE, Sir Caspar Purdon, British art connoisseur: b. County Dublin, Ireland, 1846; d. 1911. He entered the Art Training School at South Kensington in 1862, assisted in the construction of the Houses of Parliament and the South Kensington Museum in 1865–67 and in 1879 was architect to the English legation in Persia. In the following year he was commissioned to reorganize the Eastern collections at the South Kensington Museum. In 1896 he became director of the Museum and was knighted in 1902. In 1905 he became director of the Metropolitan Museum, New York, from which ill health compelled his retirement in 1910. He effected much reorganization in the Museum and during his régime many acquisitions were made.

CLARKE, Charles Cowden, English writer: b. Enfield, Middlesex, 15 Dec. 1787; d. Genoa, Italy, 13 March 1877. His father kept a small school and had John Keats as one of his pupils; but in 1810 gave it up and removed to Ramsgate. The son frequently went up to London, where he came into contact with Leigh Hunt, Shelley, Hazlitt, the Lambs and Vincent Novello, and in 1828 he married Mary, the eldest daughter of Novello. He engaged for some time in business as a bookseller and a music publisher and from 1834 till 1856 lectured throughout the country, mainly on poets and poetry. His publications include his 'Hundred Wonders' (1814); 'Adam the Gardener' (1834); 'Shakespeare Characters,' chiefly those subordinate (1863); and 'Molière Characters' (1865), the two last being collections of some of his lectures. He is best known, however, by the edition of Shakespeare which he annotated in conjunction with his wife and by the 'Shakespeare Key' (1879). His wife has written his biography (London 1887).

CLARKE, Edith Emily, American librarian: b. Syracuse, N. Y., 5 Nov. 1859. She was graduated at Syracuse University in 1881, and after teaching school some years took up library work. Having served as head cataloguer at Columbia University Library and at the Newberry Library in Chicago, she became chief cataloguer of public documents for the national government in 1895 and librarian of the University of Vermont in 1898. Leaving there in 1909 for travel and study, she has since lectured and written on library matters, making United States government publications a specialty. She has published 'Guide to the Use of United States Publications' (1916).

CLARKE, Edward Daniel, English traveler, antiquary and mineralogist: b. Willingdon, Sussex, 1769; d. London, 9 March 1822. In 1799 he started on an extensive and laborious tour through Denmark, Sweden, Lapland, Finland, Russia, Tartary, Circassia, Asia Minor, Syria, Palestine, Egypt, Greece and Turkey, returning in 1802 through Germany and France. On his return he obtained from Cambridge University the honorary degree of LL.D., in consideration of the services rendered to its public libraries and institutions by his liberal contributions, among which the greatest, perhaps, in value is the celebrated manuscript of Plato's works, with nearly 100 others and a colossal statue from Eleusis, believed by him to be that of Demeter (Ceres). To him also the British nation is indebted for the acquisition of the famous sarcophagus of Alexander the Great, which he discovered in the possession of the French troops in Egypt and which was by his means surrendered to the British army. In 1807 he commenced a course of lectures on mineralogy at Cambridge, and in 1808 a professorship of mineralogy was instituted there in his behalf. He himself had made a splendid collection of mineralogical specimens, which was purchased after his death by Cambridge University. In 1805 he became vicar of Harlton and in 1809 rector of Yeldham, Essex. In 1817 he was appointed librarian of Cambridge University. A complete edition of his travels appeared in 6 volumes (1810–23) and another in 11 volumes (1816–24), under the title of 'Travels in Various Countries of Europe, Asia and Africa.' His 'Travels,' which are the most popular of his works, are attractive from the enthusiasm of the writer and his prolific imagination.

CLARKE, Sir Edward George, English lawyer and politician: b. London, 15 Feb. 1841. He was admitted a barrister of Lincoln Inn in 1864 and was solicitor-general 1886–92. He sat in the House of Commons for Southwark in 1880, for Plymouth 1880–1900 and for the city of London, 1906. He held a leading place at the bar and in Parliament, but disagreement with the Unionist party on the South African War and on the question of tariff reform led him on two occasions to resign his seat in the House of Commons. He retired from the bar in 1914. He has published a 'Treatise on the Law of Extradition' (1886), three volumes of speeches and addresses and contributions to biblical literature.

CLARKE, Elijah, American soldier of the Revolution: b. North Carolina; d. Wilkes County, Ga., 15 Dec. 1799. He removed to Georgia in 1774, became a captain in 1776 and distinguished himself in engagements both with Indians and British on the frontiers of Georgia; was appointed a colonel of militia, engaged in the battles of Musgrove's Mill and Blackstocks, afterward promoted brigadier-general and contributed to the capture of Augusta in June 1781. At the battle of Long Cave he was severely wounded and on his recovery joined the command of General Pickens. He afterward fought many battles and made several treaties with the Creek Indians. He was accused in 1794 of a design to establish an independent government in the Creek nation, where he had settled in violation of law, and was suspected of accepting a commission and receiving emoluments from the French government.

CLARKE, Frank Wigglesworth, American chemist: b. Boston, Mass., 19 March 1847. He was graduated from the Scientific School of Harvard University in 1867, was instructor at Cornell 1869, professor in Howard University 1873–74 and professor of chemistry and physics, University of Cincinnati, 1874–83. He has been chief chemist of United States Geological Survey and honorary curator of minerals, United States National Museum, since 1883. He is a member of many American and foreign scientific societies and was a member of the International Jury of Awards at the Paris Exposition of 1900 and received from the French government the decoration of the Legion of Honor; past president of the American Chemical Society and Washington Academy of Science, member of National Academy. He has published ‘Weights, Measures and Money of All Nations’; ‘Elements of Chemistry’; ‘A Report on the Teaching of Chemistry and Physics in the United States,’ the Smithsonian ‘Constants of Nature,’ ‘The Dicta of Geochemistry’ and various official bulletins. He is also author of more than 100 scientific essays and memoirs published in magazines and scientific journals. His most important contributions to science have been his ‘Recalculation of Atomic Weights’ (3d ed., 1910), his investigations upon the constitution of the natural silicates and his ‘Treatise on the Dicta of Geochemistry.’ He is joint author with L. M. Dennis of two recent works, ‘Elementary Chemistry’ and ‘A Laboratory Manual.’

CLARKE, George Johnson, New Brunswick statesman: b. Saint Andrews, New Brunswick, 1 Oct. 1857. He was educated there and at Fredericton, was admitted to the bar of New Brunswick in 1886 and practised law in Saint Stephen. He was elected in 1903 as member for Charlotte County in the Conservative interest to the provincial legislature; was speaker of the assembly in 1909; attorney-general of the province January 1914, and became Premier and Minister of Lands and Mines in December of the same year.

CLARKE, Helen Archibald, American writer: b. Philadelphia. She was educated under governesses, at private schools, and by tutors in languages and is a graduate of the musical department of the University of Pennsylvania. She is editor (with Charlotte Porter) of *Poet Lore,* a journal devoted to the study of literature and literary criticism; also review writer for the *Dial,* and a contributor to various magazines. She is one of the founders of the American Drama Society, in which she is chairman of the Play Reading section; of the American Music Society of which she is president. She lectures on Browning and on modern drama; is honorary member of the Boston and New York Browning Societies. She is editor (with Charlotte Porter) of ‘Poems of Robert Browning’ (2 vols., 1896); ‘The Ring and the Book’ (1897); ‘Clever Tales’ (1897); ‘Mrs. Browning's Complete Works’ (6 vols., 1900); ‘The Pembroke Edition of Shakespeare’ (12 vols., 1903); ‘Poets' Parleys’ (1903); and is author of ‘Browning's England’; ‘Browning's Italy’; ‘Longfellow's Country’; ‘Guide to Mythology’; ‘Ancient Myths in Modern Poets’; ‘Hawthorne's Country’ (1910); ‘The Poets' New England’; ‘Dramatic Scenes and Pictures from the Ancient Epics’; ‘Starrylocks in Butterfly-Land,’ performed in Boston 1912; ‘Browning and His Century’; ‘Gethsemane,’ a symbolic poem set to music by Gustav Strube; and, with Charlotte Porter, ‘Browning Study Programmes’ (1900); ‘Shakespeare Studies’ (1902); ‘Balaustion's Euripides,’ performed in Boston 1915; ‘Hermes at School.’

CLARKE, Henri Jacques Guillaume, Comte D'Hunebourg and **Duc de Feltre,** French military officer: b. Landrecies 1765; d. 1818. He was educated at the Ecole Militaire, Paris, joined the cavalry and was made brigadier-general for his services at Landau. He lost his command in 1793, but was reinstated two years later and made a general of division. Carnot appointed him chief of the topographical bureau at the Ministry of War. The Directory sent him to Italy to observe Napoleon there but Clarke fell in with that commander's aims and later became his private secretary. He was governor of Vienna in 1805, of Berlin in 1806 and from 1807 to 1813 was Minister of War He declared himself a Royalist after the fall of Bonaparte, was with Louis XVIII at Ghent during the Hundred Days, and was again Minister of War in 1815–17.

CLARKE, Jacob Augustus Lockhart, English physician: b. London 1817; d. 1880. He was educated in France and studied medicine at Guy's and Saint Thomas' hospitals, London. He engaged in private practice and in original research in microscopic anatomy and pathology. A group of cells in the spinal column is known as "the posterior vesicular column of Clarke." A list of his special papers on professional topics is contained in ‘Catalogue of the Library of the Medico-Chirurgical Society’ (1879).

CLARKE, James Freeman, American Unitarian clergyman and author: b. Hanover, N. H., 4 April 1810; d. Boston, Mass., 8 June 1888. His first pastorate was at Louisville, Ky., 1833–40. He then settled in Boston in 1841; and was pastor of the Church of the Disciples which was organized especially for him, and of which he had charge till his death. He was a clear thinker and a leader in all reform and educational movements. From 1867–71 he was professor of natural religion and Christian doctrine in Harvard University. Together with Emerson and William H. Channing, he prepared the ‘Memoirs of Margaret Fuller d'Ossoli.’ His chief work was ‘Ten Great Religions.’ Among others were ‘Service Hymn-book and Hymn-book of the Church of the Disciples’; ‘Christian Doctrine of Prayer,’ 1854, new edition 1874; ‘The Hour Which Cometh’; ‘Orthodoxy: Its Truths and Errors’; ‘Steps of Belief’; ‘Events and Epochs in Religious History’; ‘The Ideas of the Apostle Paul’; ‘Self-Culture’; ‘Anti-Slavery Days’; ‘Every-Day Religion’; and ‘Vexed Questions’; ‘Theodore’ (1841), a translation from the German of De Wette; ‘Campaign of 1812’ (1848); ‘Eleven Weeks in Europe.’ Consult Hale, E. E., edition of Clarke's ‘Autobiography, Diary and Correspondence’ (Boston 1891).

CLARKE, James P., American public official and legislator: b. Yazoo City, Miss., 18

Aug. 1854; d. Little Rock, Ark., 8 Oct. 1916. He attended the common schools of Yazoo City and later obtained a finished education by saving his earnings as a printer on the Yazoo *Herald*. He studied law at the University of Virginia and was graduated in 1878. In 1879 he began practising law at Helena, Ark. He entered the political field in 1886, when he was elected to the house of representatives of Arkansas. He was elected to the State senate in 1888, becoming president of that body in 1891 and ex-officio lieutenant-governor. He was elected governor of Arkansas in 1894 and at the close of his term of office moved to Little Rock, where he resumed his law practice. He took his seat in the United States Senate on 9 March 1903, succeeding James K. Jones, and was re-elected in 1909 and 1915. He was a member of the Democratic National Committee. Senator Clarke has been president pro tempore of the Senate since the Democratic party gained control in 1913. He was chosen by the party caucus to succeed the late Senator Frye, of Maine, after a spirited contest and was elected to the place in the Sixty-fourth Congress despite determined opposition based upon his sensational revolt against the administration Ship Purchase Bill in the previous Congress. In the closing days of the 1916 session he presided over the Senate owing to the absence of Vice-President Marshall. The railroad Eight Hour Bill was passed with Senator Clarke in the chair, but he was one of the two Democratic senators to vote against the measure, and he refused to sign it. He was many times the leader in opposition to measures proposed by his party. The climax to his independence was reached when he led the Democratic revolt against the Ship Purchase Bill, which gave new life to the Republican filibuster against the measure and made its passage impossible. When the bill was reintroduced in the 1916 session, however, with the government ownership and operation features to which Senator Clarke objected, revised and modified, he supported it. He proposed the amendment to the Philippine Bill of 1916 which would give absolute independence to the islands in four years.

CLARKE, John, American clergyman: b. Suffolk, England, 8 Oct. 1609; d. Newport, R. I., 26 April 1676. He was a physician in London, and came to Massachusetts soon after its first settlement; but being one of the friends of Anne Hutchinson, was obliged to flee with her and her associates from that colony. Proceeding to the south, they were welcomed by Roger Williams to his vicinity, formed themselves into an organization, and obtained from the Indians a district to which they gave the name of the Isle of Rhodes or Rhode Island. The settlement commenced in 1638, at Pocasset, and Clarke began to employ himself as a preacher. In 1644 he founded at Newport the second Baptist church in America, and became its pastor. Venturing a few years later to preach in the vicinity of Boston, he was arrested by an officer of the government, was called first before a parish meeting and then before the court, and was condemned for what were adjudged false teachings, to pay a fine of 20 pounds or be publicly whipped. In 1651 he was sent to England in company with Roger Williams as an agent of the colony of Rhode Island, and published there a book entitled 'Ill News from New England, or a Narrative of New England's Persecution.' He succeeded in obtaining a revocation of Mr. Coddington's commission as governor, and remained in England after the return of Williams, till at the end of a 12 years' mission he had procured a second charter for the colony, which secured to every person at all times his own judgment and conscience in matters of religious concernment. Bancroft alludes to him in his history as "the modest and virtuous Clarke, the persevering and disinterested envoy." Upon his return in 1663 he resumed the pastorate of his church at Newport, which he retained till his death. He served in the general assembly from 1664 to 1669, became deputy governor in 1669 and 1671, and afterward codified the Rhode Island laws. In his will he left his farm for charitable purposes, the income of it only to be expended; and it has since produced annually about $200. Consult Richman, 'Rhode Island' (New York, 2 vols., 1902).

CLARKE, John Hessin, American jurist: b. Lisbon, Ohio, 18 Sept. 1857. He was graduated at Western Reserve University in 1877, and was admitted to the Ohio bar in 1878. He practised law in the courts of Ohio from 1878 to 1914, when he was appointed United States district judge at Cleveland by President Wilson. He has been conspicuous in progresssive movements in Ohio and in the nation at large, and has taken an especial interest in the naturalization and Americanization of foreigners. In July 1916 he was nominated by President Wilson as an associate justice of the Supreme Court of the United States, to succeed Charles Evans Hughes, the Republican nominee for the Presidency.

CLARKE, John Mason, American geologist: b. Canandaigua, N. Y., 15 April 1857. He studied at Amherst and the University of Göttingen, and in 1881–84 was professor of geology and mineralogy at Smith College. In 1885 and 1886 he was lecturer on geology at the Massachusetts State College of Agriculture at Amherst. In 1894 he was appointed professor of geology in the Rensselaer Polytechnic Institute at Troy, and in 1898 State palæontologist of New York, becoming State geologist and director of the Museum in 1904. He has written 'New Devonian Crustacea' (1882); 'Cirriped Crustacea from the Devonian' (1883); 'Ueber deutsche oberdevonische Crustaceen' (1884); 'On Devonian Spores' (1885); 'On the Higher Devonian Faunas of Ontario County, New York' (1886); 'Early Devonic History of New York and Eastern North America' (1908); 'The Eurypterida of New York,' with Ruedemann (1912); 'The Heart of Gaspé: Sketches in the Gulf of St. Lawrence' (1913), and about 200 scientific memoirs, papers and addresses.

CLARKE, McDonald, American poet: b. Bath, Me., 18 June 1798; d. New York, 5 March 1842. He was an eccentric character, familiarly known as "the mad poet"; and was the subject of an amusing poem by Halleck, called 'The Discarded.' The subjects of Clarke's verses were usually the belles of the city and topics of the day. His works include 'Poetic Sketches' (1826); and 'The Belles of

Broadway’ (1833); ‘A Review of the Eve of Eternity’ (1820); ‘The Elixir of Moonshine by the Mad Poet’ (1822); ‘Death in Disguise’ (1833); ‘A Cross and a Coronet’ (1841). One of his best known conceits was ‘Now Twilight Lets Her Curtain Down and Pins it With a Star.’

CLARKE, Mary Victoria Novello Cowden, English story-writer, essayist and Shakespearean scholar: b. London, 22 June 1809; d. Genoa, Italy, 12 Jan. 1898. She married in 1828 Charles Cowden-Clarke, with whom she wrote the ‘Shakespeare Key’ and edited an edition of Shakespeare’s plays. Her best known work is her ‘Concordance to Shakespeare,’ published in 1844–45, which cost 16 years’ labor. Other works from her pen are ‘The Girlhood of Shakespeare’s Heroines’ (1850); ‘World-noted Women’ (1858); ‘Trust and Remittance’ (1873); ‘A Rambling Story’ (1874); and an interesting autobiography, ‘My Own Life’ (1896).

CLARKE, Samuel, English theological and philosophical writer: b. Norwich, 11 Oct. 1675; d. London, 17 May 1729. He became chaplain to Dr. Moore, bishop of Norwich, and between 1699 and 1701 published ‘Essays on Baptism, Confirmation and Repentance,’ replied to Toland’s ‘Amyntor,’ and issued a paraphrase of the Gospels. He was then presented with two livings, and in 1704 and 1705 delivered the Boyle lectures at Oxford on ‘The Being and Attributes of God,’ and on ‘The Evidences of Natural and Revealed Religion.’ In 1706 he published ‘Immortality of the Soul,’ and a Latin version of Newton’s ‘Optics.’ He was then appointed rector of Saint Benet’s, London, and shortly afterward rector of Saint James’ and chaplain to Queen Anne. In 1712 he edited Cæsar’s ‘Commentaries,’ and published his ‘Scripture Doctrine of the Trinity,’ which became a subject of much controversy and of complaint in the Lower House of Convocation. His later productions were his discussions with Leibnitz and Collins on the ‘Freedom of the Will,’ and his Latin version of part of the ‘Iliad.’ His collected works were published in 1738.

CLARKE, Samuel Fessenden, American naturalist: b. Geneva, Ill., 4 June 1851. He was graduated at the Sheffield Scientific School of Yale in 1878 and took the degree of Ph.D. at Johns Hopkins in 1879. In 1879–81 he was fellow in biology at Johns Hopkins and since 1881 has been professor of natural history at Williams College. He is a member of the American Association for the Advancement of Science and of many other learned bodies and has written much on hydroids.

CLARKE, Thomas Shields, American sculptor and painter: b. Pittsburgh, 25 April 1860. He was graduated at Princeton in 1882, studied painting and sculpture at the Ecole des Beaux-arts, Paris, and in Rome and Florence. He exhibited works and won many medals at London, Madrid, Paris, Berlin, Chicago, San Francisco and Atlanta. He has executed many large works in bronze and marble for New York, Chicago and other large cities. His noteworthy works are the «Cider Press» fountain in Golden Gate Park, San Francisco; ‘Four Seasons’ on the Appellate Court building, New York, and ‘Almà Mater’ at Princeton University.

CLARKE, William Eagle, English naturalist: b. Leeds 1853. He was educated at Yorkshire College. He was made curator of the Leeds Museum in 1884 and in 1888 became assistant in the Edinburgh Museum. In 1906 he was appointed keeper of the natural history department of the Royal Scottish Museum, at Edinburgh. He also served as acting editor of the ‘Annals of Scottish Natural History’ and the *Naturalist* and was joint editor of the *Scottish Naturalist.* He published ‘Handbook of Yorkshire Vertebrata’ (1881) and ‘Studies in Bird Migration’ (1912).

CLARKE, William Horatio, American organist: b. West Newton, Mass., 1840; d. 1913. He filled positions as organist in Dedham, Boston and Woburn; was for some years superintendent of schools at Dayton, Ohio; was organist of Tremont Temple, Boston, Mass., 1878–87, where he retired to Reading, Mass., where he built the fine four-manual organ in Clarigold Hall. He published ‘New Method for Reed Organs’ (1869), and ‘Outline of the Structure of the Pipe Organ’ (1877); ‘Short Service Preludes’ (1903); ‘Valuable Organ Information’ (1904); ‘Artistic Information for Reed Organs’ (1905); ‘How to Use Organ Stops and Pedals’ (1908); ‘Standard Organ Building’ (1909).

CLARKE, William Newton, American Baptist clergyman: b. Cazenovia, N. Y., 2 Dec. 1841; d. 15 Jan. 1912. He was graduated at Colgate University 1861 and at Hamilton Theological Seminary 1863. He filled pastorates at Keene, N. H., Newton Centre, Mass., Montreal, and Hamilton, N. Y., 1863–90, and was a professor in Toronto Baptist College 1883–87. From 1890 to 1908 he was professor of Christian theology and from 1908 to his death professor of ethics, at Colgate University, Hamilton, N. Y. He wrote ‘Commentary on Mark’ (1881); ‘Outline of Theology’ (1897); ‘What Shall We Think of Christianity?’ (1899); ‘A Study of Christian Missions’ (1900); ‘The Use of the Scriptures in Theology’ (1905); ‘The Christian Doctrine of God’ (1909); and ‘Sixty Years with the Bible’ (1909).

CLARKE, William Robinson, Canadian clergyman: b. Inverurie, Scotland, 1829; d. 1912. He was educated at Aberdeen and at Oxford. He became prebendary of Wells in 1870, came to Canada in 1882 and in the same year was appointed professor of mental and moral philosophy in Trinity University. He retired in 1908. He became widely known in America as preacher, writer and lecturer. He attended several Anglican synods and in 1891 became a fellow of the Royal Society of Canada and in 1900 was its president. For a time he was editor of the *Canadian Churchman.* His publications include ‘The Redeemer’ (1863); ‘The Comforter’ (1864); ‘The Four Temperaments’ (1864); ‘Witnesses to Christ’ (1888); ‘Savonarola’ (1892); ‘The Anglican Reformation’ (1896); ‘The Paraclete’ (1900); ‘Pascal and the Port Royalists’ (1902). He translated Hagenbach’s ‘Christian Doctrine’ and Hefele’s ‘History of the Councils.’

CLARKSBURG, W. Va., county-seat of Harrison County, situated in the north central part of the State, on the West Fork River, a branch of the Monongahela, and on the Parkersburg branch of the Baltimore and Ohio Railroad, 22 miles west of Grafton. The Short Line, the Monongahela and the West Virginia and Pittsburgh divisions of the Baltimore and Ohio Railroad also enter the city. The city lies in a section abounding in natural resources, natural gas, coal and oil being plentiful; and the farm, grazing and timber lands very valuable. Clarksburg is called the "Fuel City of the Fuel State." The manufactures are many and varied, there being glass, art pottery, chair and cigar factories, chemical and carbon works, wood-working plants, machine shops, foundries, bottling works, a brewery and a grain elevator with a capacity of 80,000 bushels. There are five newspapers, daily and weekly combined. There are five banks in the city with a combined capital of $675,000, and doing an annual business of $90,000,000. Among the notable public institutions are the City, the Kesler and the Harrison County hospitals. There is an excellent free school system with a public high school, supplemented by Broaddus Classical and Scientific Institute, Saint Joseph's Academy and Elliot Commercial College. The city has nine church edifices. The city was first settled in 1772, became a borough in 1785 and was incorporated as a city in 1899. The city is proud of having been the birthplace of the famous "Stonewall" Jackson. Its municipal affairs are administered by a mayor, recorder, elected annually, chief of police and a council of 10 members, one-half of whom are elected each year. Pop. 9,201.

CLARKSDALE, Miss., city and county-seat of Coahoma County, 75 miles south of Memphis, Tenn., on the Yazoo and Mississippi Valley Railroad. There is a large trade in lumber and in agricultural products. The city contains an Elks' Home and a Carnegie library. The waterworks and electric-lighting plants are municipally owned. Clarksdale has adopted the commission form of government. Pop. 4,079.

CLARKSON, Matthew, American soldier and philanthropist: b. New York, 17 Oct. 1758; d. there, 25 April 1825. Both his father and grandfather were prominent colonial officials. He was with the Northern army in 1777; was wounded at Fort Edward; at Saratoga acted as aide-de-camp to Gen. Benedict Arnold, and was present at Burgoyne's surrender. He also took part in the campaigns in the Carolinas 1781, and was aide to Gen. Benjamin Lincoln at Yorktown. He was brevetted a lieutenant-colonel, and for 14 years was major-general of the New York militia; was a member of the State legislature; president of the Bank of New York; governor of the New York Hospital for 30 years; and was an active worker in prison and public school reform. Consult 'The Clarksons of New York' (New York 1875–76).

CLARKSON, Ralph Elmer, American artist: b. Amesbury, Mass., 3 Aug. 1861. He was educated at the Amesbury High School, studied art at the Boston Art Museum until 1884 and at the Julien Academy under Lefebvre and Boulanger in 1884–87. He exhibited at the Salon of 1887, and returned soon after to New York where he painted portraits. In 1892 he again went abroad, spending part of the time in Italy. He returned to America in 1895 and settled in Chicago. He is president of the Chicago municipal art commission and was member of the American art jury at the Paris Exposition of 1900, member of the art jury and international jury of award at the Saint Louis Exposition of 1904. He is one of the founders of the Friends of American Art and is a member of several art societies. Perhaps his best works are 'Studio Corner' and 'Twilight Harmony.'

CLARKSON, Thomas, English philanthropist and emancipationist: b. Wisbeach, Cambridgeshire, 28 March 1760; d. Playford Hall, near Ipswich, 26 Sept. 1846. He was originally intended for the Church, and studied at Saint John's College, Cambridge. He early formed a connection with a Quaker association for the suppression of negro slavery, and was introduced to Mr. Wilberforce and other distinguished opponents of slavery. While the latter advocated the cause of abolition in Parliament, Mr. Clarkson was indefatigable in obtaining information and evidence on the subject, in attending meetings in different parts of the country, and generally conducting the agitation throughout England for the suppression of the slave traffic. In 1788 a committee of the privy council made an inquiry into the state of the African trade, and in that year a bill mitigating some of the worst cruelties of the traffic was passed. In 1791 a motion by Wilberforce in favor of putting an end to the traffic was lost by 163 to 88; but his labors, and those of his party, were at last successful in England, the slave-trade being abolished by a bill passed 25 March 1807. This point gained, their next effort was to procure the total abolition of slavery in the British colonies, and in this also, after a long struggle, they succeeded, by the passing of the emancipation act in 1833. Clarkson published the 'Memoirs of William Penn' (1813), and numerous works and pamphlets in opposition to the slave trade.

CLARKSVILLE, Tenn., county-seat of Montgomery County, situated on the Louisville and Nashville Railroad near the junction of the Red and Cumberland rivers. It is the trade centre of a large tobacco-growing district, and has a number of tobacco factories, being one of the 10 leading cities of the United States in the manufacture of snuff. It also manufactures lumber, flour and agricultural implements. Valuable iron ore deposits have been discovered in the vicinity. It is the seat of the Southwestern Presbyterian University, and of a Methodist school for girls. Pop. 8,548.

CLARKSVILLE, Tex., the county-seat of Red River County, on the Texas and Pacific Railroad, about 15 miles south of the Red River, and 100 miles northwest from Dallas. It is the centre of a fertile cotton country, and its industries are such as are related to the raising and marketing of this staple, with some traffic in grain, hides and live stock. Pop. 2,065.

CLASS, CLASSIFYING, CLASSIFICATION. When the domain of a science comprehends a very great number of objects which it is necessary to describe, or whose analogies and differences require to be assigned, it is always useful, and sometimes indispensable, to make a methodical distribution of these objects, to group those which present the greatest number of common characters, to form with these groups new assemblages, continuing the process till a limit is reached where this mode of generalizing may be stopped. The highest assemblage in this ascending series is a «class» (though this term may not be technically applied to it); the procedure necessary in forming it is «classifying,» and the result, extending over some entire branch of natural science, is a «classification.» We do not begin to classify till we feel the need of it, for the task requires analysis, multiplied comparisons and researches as to the means of generalizing the particular and isolated notions which we had previously been contented to amass without regular arrangement. It is only, however, after the revision necessary for such arrangement has been undertaken that science can be said to have begun. The first attempts at generalization and classification often exercise a very important influence on the future progress of any science, and may even extend to the period when it seems to be approaching its perfection. A science consists principally in the relations of the facts observed, or knowledge acquired in connection with it. If the relations thus established are founded on accurate observations, they become in fact laws of nature, the most important and most prolific truths which human reason is able to discover. But if the imagination has been allowed to take part in the work, if it has either furnished the materials or directed the construction of the edifice, it must sooner or later be demolished, and rebuilt with better selected materials and on more solid foundations. In modern times geology commenced with faults of this description, and still seems to have difficulty in avoiding them. Natural history, to which a good classification is so essential, was not very fortunate in its first combinations: systems took possession of it, and too often blinded the inquirer to great truths which otherwise he could hardly have failed to discover. Influenced by this love of system, many, instead of submitting to the laborious investigation of facts, have come forward with some new fanciful combination, and made it almost their sole business to secure the credit of their particular classifications by overthrowing those of their predecessors or rivals. In a subject so comprehensive as natural history it seems vain to hope for a perfect classification until the resources of embryology are exhausted. Zoology is gradually tending toward a consistent system of classification, the basis of which is the resemblances of animals at various periods of their growth. The impulse to this line of research was given by Darwin. Being a strictly natural method, inasmuch as the affinities by common descent are sought after to the neglect of mere outward resemblances at a later period of life, the arrangements suggested by it to different naturalists show a considerable amount of harmony, and even those who oppose Darwin acknowledge the simplicity and consistency of embryological or genealogical classification. For the classification of the animal kingdom see ANATOMY, COMPARATIVE.

CLASSICAL LITERATURE. The term «Classical Literature» is usually applied to the literatures of Greece and Rome, though separate periods of these and other literatures are also called classical.

GREEK LITERATURE

Greek Literature may be conveniently divided into four periods, as follows: (1) Ancient or Classical, from Homer to Demosthenes (c. 700 to 300 B.C.); (2) Alexandrian, from 300 B.C. to the subjugation of Greece by Rome in 146 B.C.; (3) Græco-Roman, from 146 B.C. to the division of the empire in 330 A.D.; (4) Byzantine, from 330 A.D. to the capture of Constantinople in 1453 A.D.

I. The Classical Period.— The literature of the classical period is not artificial, but was developed naturally and in orderly succession, each branch of the race, Ionian, Æolian, Dorian, contributing its part, till the whole culminated in the glorious Attic, which is still the admiration of the educated world. We have no remains of Greek poetry before the Homeric poems, but the highly developed art displayed in them as well as the smoothness of the metres shows that some form of poetry must have been cultivated before such a state of perfection could have been reached. As forerunners then we may mention the Linus song and the songs of Ialemus and of Hylas, also hymns to the gods, marriage hymns, dirges, all which must have attained considerable artistic form before the Homeric poems were composed. During this mythic period from which we receive barely the names, such as Orpheus, Musæus and Eumolpus, to mention the best known, were developing metrical form, appropriate epithets, fixed phrases, which became the professional stock of later periods.

1. *Epic Poetry.*— The only remains of this early period are the Homeric poems, the 'Iliad' and the 'Odyssey.' The 'Iliad,' poem of Ilium or Troy, has for its subject the wrath of Achilles, about which is grouped in the most artistic way the development of the events during the 10 years' siege. It consists of 24 books and more than 15,000 lines. The 'Odyssey,' poem of Odysseus or Ulysses, tells of the wanderings and homecoming of Odysseus after the capture of Troy, into which are woven many beautiful myths giving light and shade to the dangers and trials through which the hero passed till he reached his home in Ithaca. This also consists of 24 books, but with only a little over 12,000 lines. Down to the end of the 18th century all the world believed that these poems were the work of one man, Homer, when Wolfe's 'Prolegomena ad Homerum' appeared in 1795. It is true that the ancients as early as 170 A.D. contended that Homer was the author of the 'Iliad,' though not of the 'Odyssey,' but this was as far as they went, and even then there was great opposition to this view of the «Separatists,» as they were called. Vico, of Naples, about 1700, had suggested that Homer was a myth, but it remained for Wolfe to bring forward plausible proofs of his contention that the poems were not originally one composition, but made up of several shorter poems put together without common plan. Wolfe based his arguments on the belief that writing did not exist before 600 B.C., and that the poems were first collected and written down by order of Pisistratus and that poems of such length could not be handed down by oral recitation. Following Wolfe, Lachmann and other scholars divided the poems into lays, which they believed were collected by a school of singers, called Homeridæ, and later put into their present form by order of Pisistratus. The question is still discussed, but scholars now generally accept the view that

the two poems belong to separate periods, and that each is a growth from two or three smaller poems. The poems are probably Ionic in origin, though Fick has tried to show that they are Æolic. As epic lays must have existed in abundance before the 'Iliad' and 'Odyssey' were reduced to form, it is only natural that we should find many remains of epic songs, which along with a number of hymns were all credited to Homer, but which are now described as the Epic Cycle, which has come down to us from Proclus, probably the grammarian of the 2d century after Christ. These poems lack the unity of the 'Iliad' and 'Odyssey' and were far inferior to them. Among the most important were the 'Oedipodeia,' 'Thebaid' and 'Epigoni,' all dealing with Thebes; the 'Ethiopid' and the 'Capture of Troy,' probably originally one poem, and the 'Little Iliad' were a continuation of the 'Iliad,' while the Cyprian lays were an introduction to it; the 'Nosti,' containing the story of the Greek heroes after the fall of Troy, and the 'Telegony,' dealing with the death of Odysseus by his son Telegonus, fitted in with the 'Odyssey.'

2. *Didactic.*— Closely following epic poetry is the didactic, which is like epic in form and metre. Its origin is also obscure, but we must also here suppose that some forms existed before Hesiod (c. 800 B.C.), its great representative. His poem, 'Works and Days,' treats of the arts of husbandry with an attached calendar of 60 verses. The poem is a pessimistic complaint of life, with a high moral tone, filled with saws, maxims, allegories, etc., with occasional flashes of genius. The 'Theogony,' formerly attributed to Hesiod though probably not by him, treats of the origin of things and the genealogy of the gods. Other works ascribed to Hesiod are the 'Catalogue,' the 'Eoiæ,' the 'Ægimius,' and the 'Shield of Heracles.'

3. *Lyric.*— As epic was dying, lyric, which had lain dormant during this brilliant period, and which also has its origin in the above mentioned prehistoric hymns, dirges, etc., began to be artistically cultivated. This is a natural development, for when men began to look less to their overlord and to think more of their own concerns, this change of feeling was reflected in their poetry, and thus the new personal lyric sprang up in the place of the old impersonal epic that dealt with kings and their doings. Lyric may be subdivided into the Iambic and Elegiac, which are only partially lyric, and the Melic, the true lyric type, which is itself subdivided into Æolic (or monodic) and Dorian (or choral) lyric. Preceding both these subdivisions is the nome, cultivated by Terpander and Olympus, of which only fragments remain.

(*a*) *Elegiac.*— This was used at first in threnodies and funeral lamentations, but by the 7th century its sphere was greatly extended and it was now employed to describe all sorts of personal reflections, especially of a didactic or moral nature. The metre is a distich consisting of a hexameter verse followed by the so-called pentameter, which is really a verse composed of two catalectic, dactylic trimeters. It was recited, not sung, and was very energetic and lively, being early used as a means of conveying personal reproach. Side by side and almost at the same time with the Elegiac was developed the Iambic, which was probably connected with the worship of Demeter. It early acquired a satyric turn, to which its lively tripping metre especially adapted it. It was an entirely different type from the Elegiac, but became early associated with it, because it had many characteristics in common, and the two types were often cultivated by the same poet. Like the Elegiac, the Iambic also soon gave up musical accompaniment. Among the masters in this department may be mentioned Callinus (730 B.C.?) of Ephesus, who wrote martial elegies and was probably the first elegiac poet, though this honor is also claimed for Archilochus. Archilochus (700 B.C.) of Paros, who wrote some elegies, is mostly famed as the most illustrious wielder of iambic verse, which he is said to have invented and of which he is the earliest writer. Semonides (693 B.C.) of Amorgus, who has little originality, but is not without some elegance, is chiefly known by his satyric poem in iambic verse on women. Tyrtæus (650 B.C.), the fabled lame schoolmaster of Athens, like Callinus, wrote martial elegies. Mimnermus (630 B.C.) of Colophon, the sweet-voiced singer, was the first to use elegy for the expression of love. Solon (594 B.C.) of Athens, the soldier and patriot, wrote elegies of a martial and political nature. Theognis (544 B.C.) of Megara was a sharp and poignant writer of gnomic elegy. Phocylides (540 B.C.) of Miletus was another gnomic writer, and finally comes Hipponax (546 B.C.) of Ephesus, best known as the inventor of the scazon, choliambic (or halting verse), which is an iambic trimeter that ends with a spondee, and thus produces a sort of shock, often humorous in effect. Here may also be mentioned the epigram, the literary form of which was the elegiac distich. It was cultivated by Archilochus to some extent, but the most distinguished writer of epigram was the lyric poet, Simonides of Ceos.

(*b*) *Melic.*— Unlike the preceding, the melic type was musical throughout. It was especially adapted to religious chants and held its sway in every realm of human passion. It is highly valuable, not only from a literary but also from an historical standpoint. The Æolian type, which was not only monodic, but also choral, is much simpler, less ornate, less involved than the Dorian, which was generally choral. Alcæus (606 B.C.) of Mitylene was a vigorous, graceful, passionate writer of songs of love, scholia, politics and some hymns. Sappho (611 B.C.), also of Mitylene, though probably born at Eresos, the greatest of women poets, wrote love songs of the most passionate character, full of subtle charm and exquisite grace. She also wrote epithalamia. Both these poets used the highly colored Lesbian dialect and both were often imitated by Horace. Closely allied to these in form and content, though differing from them in dialect, was Anacreon (540 B.C.) of Teos, an Ionian city, who was a writer of love songs and hymns, and while not possessing the genius or passion of either Alcæus or Sappho, yet wrote graceful verse, with an occasional vein of humorous satire. The poems called 'Anacreontics' are imitations of the Alexandrian Age, and are not altogether bad, some possessing considerable merit. The Dorian type, much more ornate and more highly involved in structure and metre than the Lesbian, dealt mostly with matters of religion and of public interests, taking as its subjects the mythical traditions of the Dorians, and was sung at festivals in honor of the gods and heroes or in commemoration of some athletic victory or the founding of some city. The dialect is Dorian of an artistic literary type, and the form varied from the simple narrative to the highly artistic dialogue. The most important forms in the order of their development were the Pæan, a hymn of joyous thanksgiving to Apollo, the Hyporchema, also a hymn to Apollo, accompanied by dancing; the Parthenion, a sort of processional song, sung by a chorus of young girls; the Dithyramb, in honor of Dionysus, of a wild and passionate nature, sung by a chorus encircling an altar; also march songs, marriage songs and such like. Thaletas (700 B.C.?) of Crete is mentioned as developing the Pæan, and Hyporchema, the metre of which he brought from his native land to Sparta. Alcman (650 B.C.) of Sardis wrote hymns, pæans, hyporchemata and scholia, and especially gave artistic form to the Parthenion. His poetry is easy, graceful and often tender. Arion (650 B.C.?) of Methymna is especially noted as the founder of the artistic dithyramb. Stesichorus (611 B.C.) of Himera in Sicily treated epic subjects in lyric form and is famous for adding the epode to the strophe and antistrophe, of choral song, whence he gets his name, his real name being Tisias. Ibycus (560 B.C.) of Rhegium in Italy, somewhat like Stesichorus in form and content, wrote both hymns and love songs. But the great masters of choral lyric arose after the Persian wars, which had a tendency to unite the widely scattered Greeks into one people and brought into prominence Athens, which then became the literary centre of the known world. Simonides (556 B.C.) of Ceos, an Ionian, of keen observation and philosophic temperament, gave his genius to the cultivation of the Dorian lyric and achieved the highest fame. He was also distinguished in other departments of poetry, notably the elegy and the epigram, hymns to the gods, pæans, dirges, odes of victory, etc. Simonides is also remarkable as being, so-to-speak, the first national poet, for he was an Ionian by birth, wrote in the Dorian dialect, and at Athens, the future world power. Next may be mentioned his nephew, Bacchylides (470 B.C.), of whom 20 poems practically complete and several long fragments were discovered in 1897, which give us a much higher opinion of this smooth and graceful poet. Greatest of all the lyric poets was Pindar (521 B.C.) of Thebes, who was a contemporary of Bacchylides and contended with him for prizes, but was by no means a rival, for Pindar is brilliant, lofty in diction and in thought, full of religious reverence, deeply in earnest, abounding in poetic imagery, of an independent genius, always grand. His extant works consist of 45 complete odes of victory, written in honor of the victors at the great national games, besides many fragments representing almost every species of lyric composition.

4. *Drama.*— As its name implies, drama is distinguished from epic by action, and grew out of the cult of Dionysus, which was deeply tinged with religion. The people of one section would gather together and worship Dionysus, the god of wine, at vintage time. When in time, the chorus leader impersonating Dionysus told of some adventure, the chorus would burst into song suited to the feelings aroused by the story, which might be sad and dirge-like or joyous and hilarious. Later this story of adventure and the chorus singing developed into a dialogue, and when such dialogue was repeated several times during a festival and then extended to other myths, drama was begun. In time costumes were improved and masks were added; from the simple dialogue noted above, dialogue was now carried on between the chorus leader and one member of the chorus instead of the entire chorus, so that the number of actors was increased to two and later to three. The chorus was at the same time reduced to 12 or 15 (in comedy to 24), and thus became less prominent. When the drama developed, special actors were demanded and these were paid by the state. There was no theatre at first, though soon seats of wood were erected, and later of stone, cut out of the rock on the slope of a hill, with a capacity of 20,000 people; there was no covering. At the front of the seats was the orchestra or circular dancing place, in which was an altar, about which the chorus performed its evolutions. At the rear of the altar was a wall for the scenery and behind this was some rude machinery, such as the noted eccyclema, a sort of rolling platform; there was likely no stage. Dramatic representation was under the care of the state and consisted of a contest among three poets, each of whom contended with three pieces and a satyric drama. The drama was divided into tragedy and comedy, which grew up side by side, though tragedy was first to attain artistic form.

(*a*) *Tragedy.*— Passing by Thespis, Phrynicus and others who were helping to develop tragedy, we come to the masters, Æschylus, Sophocles, Euripides, in whose hands tragedy reached its greatest height. Æschylus (525–456 B.C.) was a stern, proud, deeply religious man, with a vigorous imagination, and gifted with the power of seeing the grand and terrible in nature. His plays show vigor and subtlety of thought rather than grace and delicacy. He is believed to have composed about 70 dramas and 20 satyr dramas, of which only seven have come down to us, the best being the 'Agamemnon' and the 'Prometheus Bound.' Sophocles (495–406 B.C.), the greatest of the three tragic writers, was a man of charming personality, endowed with brilliant poetic talent; his imagination was haply not so vigorous as Æschylus's, but more spontaneous and versatile, and he had a very keen insight into and appreciation of human nature. His plays exhibit deep reflection and serious thought combined with the most exquisite grace and perfection of form. Of about 120 plays only seven are extant, of which the best are the 'Antigone,' 'Electra' and 'Œdipus Tyrannus,' the last being perhaps the greatest tragedy ever written. Euripides (480–406 B.C.), though a great poet, did not maintain the lofty standard set by Æschylus and Sophocles. He was a man of keen sensibility, with a highly impressionable and sympathetic nature, a glowing imagination, but thoroughly impregnated with the sophistry of his time. His plays have much grace and beauty, but lack the power of Æschylus and the perfection of Sophocles. There are often passages of brilliant effect, and he rises to his greatest height in the portrayal of the innermost feelings of the heart. He was not so popular in his lifetime as he became later, and so of his 75 or 90 plays, only 18 are preserved, exclusive of the 'Rhesus,' which is certainly spurious. The best plays are perhaps the 'Medea,' the 'Iphigeneia at Aulis' and the 'Ion.'

(*b*) *Comedy.*— From comus, which was a rustic procession bearing an emblem of fecundity and singing phallic chants at the country Dionysiac festivals, with which comedy was closely associated. When comedy became important it was taken under the care of the authorities at Athens and the competitions were held especially at the Lenæa, about the end of winter. Comedy is usually divided into the «Old,» «Middle» and «New.» Old comedy, which held sway from about 480 to 400 B.C., usually dealt with some political or moral subject, and was characterized by the wildest extravagance of fancy and indulgence of keen personal satire accompanied with brilliant and too often coarse wit. Like tragedy, it had a structure of its own which varied little in the different plays. The Parabasis, consisting of songs and spoken passages, is a relic of the old comus and was used to present the personal views of the poet. The language is the spoken Attic in its highest purity. The chief representatives of the old comedy are Cratinus, Crates, Pherecrates, Aristophanes, Eupolis, of whom Aristophanes (450 B.C.) is far the greatest. Eleven of his plays are extant showing the characteristics of old comedy, couched in elegant language and with the most exquisite grace. Middle comedy (400–330 B.C.), which arose at the end of the Peloponnesian War, loses the vivacity and extravagance of the old and has to do with character sketches and everyday life rather than with political satire. Its chief representatives were Antiphanes (425 B.C.?) and Alexis (390 B.C.). New comedy lost the chorus, and giving up the artificiality of the former period, came nearer to real life, taking its subjects from everyday experience, of which love is the enduring type. This is the prototype of the Latin comedians, Plautus and Terence, and was cultivated by Diphilus, Apollodorus, Philemon, Menander, Posidippus and others, of whom Menander (324 B.C.) was the greatest. No plays of these writers are extant, but the fragments abundantly testify to the loss we have sustained. Earlier than Attic comedy is Sicilian, which was cultivated chiefly by Epicharmus and Sophron.

5. *History.*— While poetry was at its highest point of development, Greek prose was coming into life in Ionia and now became the medium of philosophical writings, which had earlier used the almost prose Iambic verse. The beginnings of history were made by the compilers of ancient myths and legends, records of events, genealogies, etc., mostly of a local nature, and later they extended their sphere to foreign countries, when some geography and description were added, but wholly of an uncritical kind. Among these early writers of history may be mentioned Hecatæus of Miletus (c. 500 B.C.), Pherecydes of Leros (450 B.C.) and Hellanicus of Mitylene (450 B.C.). But the only one whose works are now extant is Herodotus of Halicarnassus (484–406 B.C.?), called the «Father of History.» In the earlier part of his life he was a great traveler and visited nearly every part of the then known world, making researches for his future work. His history consists of nine books named after the Muses, of which the first part treats of the Persian Empire, its rise and power, while the latter half deals with the Persian invasion of Europe. He weaves into his work much geographical and social material. He uses the Ionic dialect and is really the first writer of artistic prose. His style is simple, graceful and charming. We cannot doubt his sincere search after truth, but his love for the marvellous and his great skill as a story-teller led him into exaggeration and caused him to bring in many side issues, which raise suspicion as to his credibility. Thucydides of Athens (471–400 B.C.), the greatest historian of Greece and one of the greatest of the world, wrote in eight books a history of the Peloponnesian wars, using the Attic dialect, and is justly styled the first philosophical historian, inasmuch as he not only gives the events, but also seeks the causes and the political and moral lessons to be drawn from them. Banished, probably for failure in a naval battle, he watched the progress of the war from the outside, but he was absolutely impartial. The speeches, largely imaginary, serve to convey his philosophical ideas of the causes of events. His style is exceedingly forceful and intense, but often involved and obscure, due in large measure to his striving after brevity, for every sentence is overcharged with thought. Xenophon (434–355 B.C.), also of Athens, continued the work of Thucydides in the first two books of his 'Hellenica,' which consists of seven books and is a very dry history, full of moralizings and with strong predispositions in favor of Sparta. His greatest work is the 'Anabasis,' in seven books, which is a very vivid account of the march of the 10,000 Greek mercenaries with Cyrus the Younger, when he tried to wrest the kingdom from his brother Artaxerxes. Xenophon was himself a member of the expedition, at first as an onlooker, but later as a leader, so that he gives us a vivid and interesting personal account of it. Among other works are 'Cyropædia' (or Education of Cyrus), a sort of historical romance, in eight books, the 'Memorabilia of Socrates,' a vindication of the great philosopher, the 'Œconomicus,' 'Hiero,' 'Convivium,' 'Agesilaus,' and other essays, some probably spurious. Other historians of whom only fragments are extant are Ctesias (415 B.C.) of Cnidus, physician at the court of Artaxerxes; Mnemon, who wrote, in Ionic Greek, histories of Persia and India, Philistus of Syracuse, Ephorus of Cyme, Theopompus of Chios, the last two from the school of Isocrates, and the authors of the Atthids, collections of historical and archæological material.

6. *Philosophy.*—Although philosophy had its beginnings in Ionia at the same time with history we have no literature extant before Plato. Thales, Anaximander and Anaximenes were the first to seek the causes of things and busied themselves with the physical world. Then came Heraclitus (475–335 B.C.) of Ephesus, whose work on nature, of which some fragments are extant, is among the oldest Greek prose, and Pythagoras (c. 540 B.C.) of Samos, who first used the name «philosophia,» founded an independent school, and brought philosophy into closer touch with everyday life. Xenophanes (c. 570 B.C.) of Colophon, the father of pantheism, founded the Eleatic School. He was followed by Parmenides (510 B.C.) of Elea, his disciple, and by

Empedocles (492) of Agrigentum. Anaximenes (510 B.C.) of Clazomenæ was one of the deepest thinkers and carried philosophy to Athens, where it received its highest perfection in Socrates (469–399 B.C.), who, though he wrote nothing, gave the mightiest impetus to his disciples. First and foremost is Plato (438–348 B.C.) of Athens, who founded the Academic School. Plato, of a highly sensitive and poetic temperament, received the best possible education, which he enriched with extensive travel. He wrote much in every department of philosophy, ethics, metaphysics, politics, using the dialogue, with Socrates as the central figure. The vivid imagination and dramatic style which are seen in all his writings rendered them ever fresh and attractive. Forty-two dialogues are extant, of which about 25 are genuine, the best known being the ‹Apology,› ‹Crito,› ‹Phædo,› with the longer works of the ‹Republic› and the ‹Laws.› Only fragments remain of Heraclides Ponticus, the scholar of Plato. Aristotle (384–322 B.C.) of Stagira was the most distinguished pupil of Plato and founded the Peripatetic School. He was a «practical» man, wholly unlike the idealist Plato. He ranged over the entire world of knowledge, treating everything from the practical standpoint, as opposed to the idealistic and speculative. His works, written in the common dialect, in a clear and precise, though often bald style, are very numerous, as he wrote on every department of knowledge, literature, philosophy and science. His greatest works are perhaps the ‹Logic,› the ‹Nicomachean Ethics,› and the ‹Politics.› Highly valuable also is the ‹Athenian Constitution,› which was discovered in 1891.

7. *Rhetoric and Oratory.*— Real Greek prose began at Athens between 430 and 410 B.C. The great orators of the early period, Themistocles and Pericles, did not write their speeches, as did the later orators, of whom only 10 were deemed worthy of a place in the Alexandrian canon. First in order comes Antiphon (480 B.C.), whose style, elaborate and rugged, exhibits a fondness for antithesis somewhat like that of Thucydides. Fifteen speeches are extant. Andocides (440 B.C.), of whom we have four speeches, is not a stylist, though he shows much force and vividness in description. These two cultivated judicial oratory. Lysias (440 B.C.) was an almost perfect stylist and greatly advanced Attic prose. Thirty speeches, composed in plain but graceful style, are extant. Isocrates (436 B.C.), of whose speeches 21 are preserved and who wrote speeches to be read rather than delivered, is famous for his smoothness of diction and periodic structure, a style which has been transmitted through Cicero to all the modern literatures. Isæus (420 B.C.), of whom we have 11 speeches and a fragment of a 12th, resembles Lysias in style, but is much more vigorous. Demosthenes (384 B.C.), who was a pupil of Isæus, carried oratory to its highest pitch. He was an indefatigable worker, and while his speeches may seem somewhat elaborated, as is charged, they are sincere, vigorous and intense, showing purity of diction and perfection of form. Famous is the oration ‹On the Crown› in reply to his contemporary, Æschines (389 B.C.), himself a distinguished orator. Æschines has left us three speeches in good fluent style, but lacking in sincerity. Two other contemporaries were good orators, but far inferior, Lycurgus (390 B.C.) and Hypereides (389 B.C).

8. *Medicine.*—The only works extant are those of Hippocrates (460 B.C.) of Cos, who was the founder of medicine. These are written in the Ionic dialect in plain language and without any pretensions of style.

II. Alexandrian Period (300-30 B.C.).— In this age the spontaneous production of literature ceases and in its stead arise science and criticism, for the enlargement of the Greek world by the conquests of Alexander rendered the appeal to the learned few rather than to the masses inevitable. Prose becomes now more important than poetry, which is mostly learned and highly artificial. Ideality and art are gone; imitation and science have come in. Alexandria as a centre of literary activity rivals Athens. The following departments were cultivated:

1. *Poetry.*— Besides the new comedy, the most important is the pastoral poetry, the only new style, cultivated by Theocritus (270 B.C.) of Syracuse. His poems, called idylls, deal with the rustic life. The dialect is Dorian and the metre is hexameter. Theocritus is largely artificial and conventional, but exhibits true emotion and a deep feeling for nature. Thirty-one idylls are extant besides some epigrams and fragments. Bion (260 B.C.) of Ionia, and Moschus (c. 150 B.C.) of Syracuse, also cultivated pastoral poetry with considerable success. Here may also be mentioned Herondas (250 B.C.), whose recently discovered poems, called ‹Mimiambi› (sketches of daily life), were published in 1891. Learned poetry was represented by Callimachus (260 B.C.), of whom we have six hymns and some epigrams, but only fragments of his elegies. Apollonius Rhodius (194 B.C.), a grammarian, wrote an epic on Jason, called ‹Argonautica,› in imitation of Homer, but it is highly artificial. Lycophron (260 B.C.) cultivated tragedy. In didactic poetry Aratus (270 B.C.) wrote a poem on astronomy, which has little merit, and Nicander (150 B.C.) wrote a medical treatise in verse. Nicander also wrote ‹Georgics,› which had some influence on Virgil, and ‹Metamorphoses,› which were used by Ovid. Parody and satire also flourished in the hand of Timon (280 B.C.) of Phlius, whose satiric poems are called ‹Silloi.›

2. *Philosophy.*—The old philosophy was gone and in its stead we find Stoicism and Epicureanism (qq.v.). Here may be mentioned Theophrastus (374–287 B.C.), whose work on ‹Characters› is still extant, and Chrysippus, the Stoic.

3. *Philology and Criticism.*—The establishment of the Museum by Ptolemy I gave great impetus to philological and critical study. Zenodotus (280 B.C.), who began the work of revising and explaining the Greek poets, wrote memoirs and lists of rare words and phrases. Aristophanes (200 B.C.) of Byzantium, who introduced the signs used to mark accents, and Aristarchus (150 B.C.), the text critic, were the greatest of the Alexandrian scholars. The science of grammar was now established. Apollodorus (140 B.C.) wrote a work on mythology. Dionysius Thrax (110 B.C.) wrote the first grammar, which was used as a textbook as late as the 12th century.

4. *Science.*— Some advance had been made in astronomy, mathematics and geography, when Euclid (300 B.C.) gave to the world his ‹Elements of Geometry,› which is still a famous

work. Archimedes (d. 212 B.C.), who invented the screw, was a distinguished scientist, as was also Apollonius. Eratosthenes (d. 194 B.C.) founded scientific geography and chronology. Here we may mention Hipparchus (160 B.C.), the founder of scientific astronomy, and also the Athenian philosophers, especially the Peripatetics, who busied themselves with science.

5. *History.*— History was but sparingly cultivated, its greatest representative being Polybius (204–122 B.C.). His work was a record of Roman conquests in 40 books, of which we have the first five entire and fragments of the remaining.

III. Roman Period.— In this period Greek literature spread over the civilized world. Incipient universities sprang up in different places and with them the striving after form and style, especially in prose, poetry being practically neglected.

1. *History* was cultivated in the early part of this period by Diodorus Siculus (b. 40 B.C.), who wrote a history of the world in 40 books, of which only books I–V and XI–XX with some fragments are preserved. Dionysius of Halicarnassus (d. 7 B.C.), of whose Archæology (or Roman History) books I–X have reached us, is much better known by his rhetorical works and critical essays on the classic prose writers. We may also mention in this department Josephus (37 A.D.), who wrote a history of the Jews, Arrian (100 A.D.), who wrote the history of Alexander's expedition and of India, and Dio Cassius, Appian and Herodian, who wrote histories of Rome.

2. *Biography* was especially cultivated by Plutarch (40 A.D.), whose 'Parallel Lives' and ethical works have come down to us. Diogenes Laërtius, Flavius Philostratus and Apollonius of Tyana were also composers of lives.

3. *Geography* was represented by Strabo (18 A.D.) in 17 books, and Pausanias (160 A.D.), whose description of Greece is of the highest value. We may also mention Ptolemy (160 A.D.) of Alexandria, whose geography, based on mathematical and astronomical principles, held its own till replaced by the Copernican System.

4. *Philology* was studied by Julius Pollux, and Phrynicus, the Atticists, and by the grammarians Apollonius Dyscolus and his son Herodian. Athenæus (190 A.D.) is especially known for his 'Diepnosophistæ,' or 'Table Talk,' which is very dry, but has a wide range and contains valuable material. Galen (160 A.D.), besides his medical work, wrote on Plato and Hippocrates. Polyænus (170 A.D.) and Ælian (220 A.D.) have left us collections of anecdotes.

5. *Rhetoric* was systematized by Hermogenes (170 A.D.) It was also cultivated by Longinus (c. 213 A.D.), to whom is ascribed the work 'On the Sublime,' Dio Chrysostum (c. 50 A.D.), and others. Especially worthy of mention is Lucian (160 A.D.), the satirist and rhetorican, whose works are of varied interest and constitute the best prose since the decline.

6. *Philosophy* was little cultivated. We may mention Epictetus and Marcus Aurelius, the Stoics and Moralists, Plotinus and Porphyry, the Neo-Platonists and Sextus Empiricus, the skeptic.

7. *Poetry* was practically neglected. The only name worthy of mention is Babrius (40 A.D.), who put the fables ascribed to Æsop into choliambic verse.

8. Here may also be mentioned the Christian writers, Justin Martyr (c. 105 A.D.), Clement of Alexandria (c. 150 A.D.) and his pupil, Origen (c. 185 A.D.), who wrote in the Greek spirit for the advancement of Christian truth.

IV. Byzantine Period.— There is little to notice here. Poetry and Rhetoric are still cultivated slightly, but there is no creative faculty. Even the learning of the former age is dying out. It is the age of compilations, selections, anthologies. We have the novelist Heliodorus (390 A.D.) with his followers, Achilles, Tatius and Chariton. In poetry only Nonnus's (c. 400 A.D.?) 'The Adventures of Dionysus' and Quintus Smyrnæus's 'Sequel to the Iliad' are worth mentioning. Well known is Stobæus's 'Florilegium and Eclogæ' and the 'Anthology of Cephalas,' now called 'Palatine.' Libanius gives some interesting features of university life. Learning is represented by Chœrobuscus, the grammarian, Eustathius, the commentator of Homer, Photius, Hesychius and Suidas, the lexicographers. Zosimus, Procopius and Zonoras cultivated history. The most important of the Christian writers are Eusebius, Gregory and Chrysostom.

ROMAN LITERATURE

The Romans were an intensely practical people, endowed with less imagination and less creative power than the Greeks, and also lacked their fine feeling for the beautiful. Hence their literature does not have the same freshness and originality, though it is not less important, for through Cicero the prose style of Isocrates was transmitted to modern literature, and their laws live in many modern constitutions. The literary activity of the Romans may be divided into five periods: (1) Prehistoric; (2) Archaic from Livius Andronicus to Cicero (240–70 B.C.); (3) The Golden or Classical (70 B.C. to 14 A.D.), embracing the Ciceronian and Augustan Periods; (4) The Silver Age (14–117 A.D.); (5) The Period of Decline (117–500 A.D.).

I. The Prehistoric Period.— The beginnings of Roman Literature were poetic and we find here carmina or songs on historical subjects, hymns to the dead, sacred songs, etc., composed in the Saturnian metre, and some epitaphs. The beginnings of drama are seen in the farce plays, 'Fescennini,' 'Satura,' 'Atellana.' Prose was confined to treatises, annals, laws, of which latter we may mention the 'Leges XII Tabularum,' which were committed to memory as the commandments. The only prose writer of this period was Appius Claudius Cæcus, whose speech against Pyrrhus was long extant.

II. The Archaic Period.— Historic Roman Literature begins with Livius Andronicus (284–204 B.C.), who besides making a dull and dry translation of the 'Odyssey,' wrote comedies and tragedies based on the Greek. Cn. Nævius (264–194 B.C.) also wrote plays and an epic poem on the First Punic War, still using the Saturnian metre but showing more skill and originality than Livius Andronicus. The most important comedian of all is T. Maccius Plautus (254–184 B.C.), to whom about 130 plays are ascribed. Of these Varro selected about 31 as genuine and probably 19 others are genuine. Of the plays selected by Varro as genuine, 20 are still extant and considerable fragments of the 21st, the

'Vidularia.' Plautus's plays are all based on the Greek. He shows great ability in working out the plots, handles his metres freely, but skilfully, and is a perfect master of the popular speech. His dialogue is bright and lively, full of rude wit and keen humor. His plays were long exhibited on the stage and studied in the schools and have been widely imitated in modern times. P. Terentius (185–159 B.C.) was brought as a slave to Rome, where he was liberated. His intimacy with Scipio Africanus and Caius Lælius gave rise to the belief that Scipio was the author of his plays. Six plays are extant, which are mostly imitated from Menander. Terence has neither the luxuriant genius nor the creative ability of Plautus and lacks his pungent wit, but he is more reflective, more melodious, more artistic. His language is that of the best cultivated circles, and possesses elegance and grace. He was greatly admired by later Romans, and like Plautus has been a model for modern dramatists. Here may also be mentioned Statius Cæcilius, who imitated the new comedy of the Greeks, and Luscius Lanuvinus, the enemy and rival of Terence. The Fabula Togata or national comedy found its chief representative in L. Afranius (c. 150 B.C.), a man of considerable ability. Tragedy was cultivated especially by M. Pacuvius (220–132 B.C.), of whose 13 plays we have only fragments, and L. Accius (170–94 B.C.), who wrote about 40 tragedies. He was greatly admired by Cicero, Horace and others. Besides Livius Andronicus and Cn. Nævius, already mentioned, the epic was treated by Q. Ennius (239–169 B.C.), who far outshone the others and may be called with Horace "Father Ennius," as the real founder of Latin poetry. His great work, besides comedies, tragedies, saturæ, was the 'Annales' in 18 books, of which only fragments are preserved. His verse is often rude and forced, but he was a man of talent, possessing a vivid imagination and great skill in handling the language. He introduced the hexameter verse to take the place of the Saturnian, and his work marks an epoch in the language changes produced. He was greatly admired by Cicero, who was fond of quoting him. Ennius also wrote saturæ, but he was surpassed in this by C. Lucilius (150–103 B.C.), whose verse was rude and unfinished, but full of keen wit and searching criticism of public men and public affairs. Lucilius deserves special mention for giving the satura the nature of an invective poem. About 900 fragments are preserved.

Before prose was sufficiently developed, the early historians, especially Q. Fabius Pictor (c. 210 B.C.) and L. Cinnius Alimentus (c. 209 B.C.), used the Greek tongue. The real founder of Latin prose is M. Porcius Cato (234–149 B.C.), a voluminous writer on many subjects. His works comprise 'Origines' in seven books, on the rise and growth of Rome and the origin of Italian cities, 'De Re Rustica,' still extant, and many speeches. Among other historians may be mentioned S. Cornelius Sisenna (119–67 B.C.), Claudius Quadrigarius, Velerius Antias and Licinius Macer, whose work was much used by Livy. In oratory, besides Cato, we find S. Sulpicius Galba, C. Gracchus, M. Antonius, L. Crassus, Q. Fabius Maximus, M. Cornelius Cethegus and Q. Hortensius (114–50 B.C.), who was the bridge between these orators and Cicero. Also worthy of mention are S. Ælius Pætus, who wrote the first law book, 'Tripertita,' and L. Ælius Stilo, the first philologian. The 'Rhetorica ad Herennium,' in four books, an important work on rhetoric, also belongs to this period. Its author is unknown, but it does not belong to Cicero or Cornificius, to each of whom it has been ascribed.

III. Golden or Classical Period.— This period contains the best of Roman literature and may for convenience be divided into the Ciceronian and Augustan ages, the former being characterized by the highest development of prose, the latter of poetry.

(*a*) *The Ciceronian Period.*— The first great writer of this age is M. Terentius Varro (116–28 B.C.), of ancient family and high rank, who was the most learned man and most extensive writer of ancient Rome. In his works, 74 in number, in more than 600 volumes, he treated almost every conceivable subject, literature, oratory, history, philosophy, grammar, jurisprudence, geography, agriculture, etc. Of especial importance are his 'Saturæ Menippeæ,' in which he used both prose and verse form to satirize the condition of his times. By far the greatest name in Roman literature is M. Tullius Cicero (106–43 B.C.), the son of a Roman knight, born near Arpinum in Latium. He was remarkably endowed both physically and mentally. He was tall and commanding in appearance, possessed of a fine memory, vivid imagination, quick and ready wit, intense feeling and a kindly, generous disposition. To these natural gifts he brought the most untiring energy in his eager acquirement of knowledge of every kind and enjoyed the instruction of the very best masters. He was an intense and honest patriot, but lacked political sagacity and the courage of his convictions. His appreciation of the beautiful, supplemented by his study of the Greek writers, led him to reproduce their thoughts in Latin, and thus he became the founder of the finest prose that ever was known to the Romans. His highest achievement was in oratory, and his speeches, both political and legal, are among the finest remains of Roman literature. His correspondence was prolific and is of immense value from an historical as well as from a linguistic point of view. In his later years, when the party of Cæsar was in the ascendency, he retired to private life and composed his philosophical works, largely as a solace for his troubles, but also to acquaint his people with the best systems of the Greeks. Of over 100 speeches we have 57 complete, and fragments of about 70 others, while the rest are known to us only by tradition. The greatest speeches are the four against Catiline, one for Milo, one against Verres and the second against Antony, one of the most powerful invectives in any language. His rhetorical works are an outgrowth of his preparation for oratory. In this work his aim was to modify and fit existing systems to Roman needs. The rhetorical works are as follows: 'De Inventione,' in two books, very crude and immature; 'De Oratore,' in three books, in dialogue form, with the two great orators, L. Crassus and M. Antonius, as the chief speakers, a splendid work, full of vivacity and eloquence and composed in magnificent style; 'Brutus, sive de Claris Oratoribus,' also in dialogue form, a history of Roman oratory. In the 'Orator ad M. Brutum,' Cicero paints his ideal orator. In the

'Partitiones Oratoriæ,' didactic in nature, Cicero quizzes his son on rhetorical matters. 'Topica ad C. Trebatium' is an explanation from memory of Aristotle's 'Topica.' 'De Optimo Genere Oratorum' is a discourse on the Asiatic and Attic styles of oratory, being an introduction to his translation of the two famous speeches of Æschines and Demosthenes 'On the Crown,' which translation is, however, unfortunately lost. Philosophy was not kindly received at Rome, and while Ennius and others had treated it slightly, it remained for Cicero to transplant it and settle it firmly on Roman soil. In philosophy Cicero was an eclectic, being almost wholly dependent on the Greek thinkers, so that his philosophical works are important more for their elegance of composition and beautiful style than for their matter, though this is important too, as it often deals with systems of philosophy otherwise unknown to us. His philosophical works are 'De Republica,' a treatise on government in six books, of which only about a third is preserved; 'De Legibus,' also incomplete and probably originally in six books; it is a treatise on Church and state law; 'Paradoxa' is an explanation of Stoic principles; 'Consolatio,' of which only fragments exist, was occasioned by his daughter's death; 'Hortensius,' also fragmentary, recommends the study of philosophy; 'De Finibus Bonorum et Malorum,' in five books, is an exposition and criticism of the Highest Good and Evil as taught by the Greek philosophers; 'Academica,' in two editions, of which the first, Lucullus, is extant, the last, Varro, only in fragments, is an exposition of the doctrines of the Academy; 'Tusculanæ Disputationes,' in five books, discusses matters pertaining to a happy life; 'Timæus,' a fragment, is a free translation of Plato's dialogue of the same name; 'De Natura Deorum,' in three books, deals with the Deity and his relation to the world; 'De Divinatione,' in two books, on the doctrine of soothsaying, with arguments against it; 'Cato Maior, sive De Senectute,' a delightful essay on old age, containing an outline of Cato's character, cheerful in tone and finished in style; 'De Fato,' a fragment, against the Stoic doctrine of Fate; 'Lælius, sive De Amicitia,' another charming essay on Friendship, written in vivid style and choice language; 'De Officiis,' in three books, is a system of ethics addressed to his son; 'De Gloria,' 'De Virtutibus' and 'De Auguriis,' with translations from Xenophon and Plato are now lost. Cicero also wrote 'De Iure' and composed the history of his consulship, which are also lost. His two poetic efforts, 'De suo Consulatu' and 'De Temporibus Suis' were very unfortunate and subjected him to considerable ridicule. Cicero greatly dignified the art of letter-writing, and his letters, written in a graceful, conversational style, are a perfect storehouse of information for the history of his times. We possess in all 864 letters (including 90 addressed to Cicero) distributed as follows: 'Ad Familiares,' 16 books; 'Ad Atticum,' 16 books; 'Ad Quintum Fratrem,' 3 books; 'Ad Brutum,' 2 books, the genuineness of the latter being vigorously disputed and defended by many scholars. Coequal with Cicero as a writer was the great Julius Cæsar (100–44 B.C.), a man distinguished in many departments of life, being a great statesman, general, orator, historian and grammarian. His chief literary works that have reached us are 'Commentarii de Bello Gallico,' in seven books, and 'De Bello Civili,' in three books, written in elegant, simple and clear style. The eighth book 'De Bello Gallico' was written by A. Hirtius as was the 'Bellum Alexandrinum,' but the 'Bellum Africum' and the 'Bellum Hispaniense' are by unknown hands. Cornelius Nepos (99–24 B.C.), the friend of Catullus, Cicero and Atticus, was the author of many works, of which only a part of the 'De Illustribus Viris' is extant, written in an easy, but often monotonous and impure style. Caius Sallustius Crispus (86–34 B.C.), the enemy of Cicero and Pompey, was the first to treat historical writing as an art, and took for his model Thucydides. Of his works, the 'De Coniuratione Catilinæ' and the 'Bellum Iugurthinum' have reached us entire, but of the histories, in five books, we have only fragments. Sallust's style is very concise and his language is artificial and archaic, and, though sometimes obscure, it is extremely forcible and vivid. Poetry in this period was cultivated by T. Lucretius Carus (96–55 B.C.), who wrote a didactic poem in six books, 'De Rerum Natura,' in which he tried to free the mind from all kinds of superstition by a rational study of nature, basing his work on the philosophy of Epicurus. Lucretius was a masterful genius with great poetic instinct and independent spirit. On account of the poverty of the language in philosophical expression, the archaic style of the poem and the dry and abstruse subject-matter, it is often difficult to understand. Horace and Ovid were greatly influenced by him. The greatest poet of the period, and perhaps the greatest Rome ever produced, was C. Valerius Catullus (87–53 B.C.), the lyrist, from whom we have 116 poems on various subjects in various and sometimes rare metres. Catullus, impulsive and frank by nature, is pre-eminently the poet of passion, showing his best work in his short love songs, which are written in splendid, but simple and chaste, style.

(*b*) *The Augustan Period.*— P. Virgilius Maro (70–19 B.C.), the greatest epic writer of Rome, enjoyed the highest educational advantages, was gentle and pure, amiable, bashful, not a genius, but a slow, laborious worker, carefully polishing all he wrote. His extant poems are 'Bucolics,' or 'Eclogæ,' 10 in number, which are imitations of Theocritus; 'Georgica,' in four books, in which he followed Hesiod, Aratus and others as models, though great independence is shown, as the subject was congenial to his personal taste and experience. The warmth and vividness, skilful use of language and pleasing arrangement of the episodes make these the most artistically perfect of all the Roman poems that have reached us. The 'Æneid,' in 12 books, never received the poet's finishing touch, so that he wished it to be destroyed. This masterly poem, one of the greatest epics of the world, treats of the adventures of Æneas, the 'Odyssey' being the model for the first six books, the 'Iliad' for the last six. The language is elegant and at times sublime, but it lacks the simplicity of the Homeric poems. Besides these, several minor poems are perhaps wrongly attributed to Virgil. Q. Horatius Flaccus (65–8 B.C.), the most popular poet of Rome, brought the satire to its highest perfection. We have two books of satire, the former containing 10, the latter eight, poems, of which the subject matter is varied, the tone good-natured, though at times sharp, and the style easy and conversational. At about the same time, and in like tone, were produced the Epodes, which, like the Odes in form, are like the Satires in content, though more specific and less generous. The Odes, by which Horace is probably best known, and which are based on Greek models, especially Alcæus, Sappho and Anacreon, though not wholly dependent on them, are elaborately wrought out, showing much warmth of feeling, but little of passion and imagination. The skilfully handled metres, the well-chosen language as well as the artistic and happy setting, make the Odes the delight of all. In his later years he produced the ‹Epistles,› in two books, of which the first has 20, the latter three, poems. These are of the same general character with the Satires, but show greater care and better style. Especially famous is the third epistle of the second book, called by Quintilian «Liber de Arte Poetica,» in which Horace discusses with fine taste a series of literary questions. Albius Tibullus (c. 54–19 B.C.), the Roman elegiac poet, was passionate in nature, warm and sympathetic. Four books of elegies are ascribed to him, of which the third and part of the fourth are spurious. They show a refined taste, great felicity of expression and smoothness of metre. Sextus Propertius (c. 50–15 B.C.), a younger contemporary of Tibullus, also wrote elegies, of which we have five books. He was sensuous and passionate by nature, full of fire and originality, but often obscure and difficult on account of the multitude of mythological allusions. P. Ovidius Naso (48 B.C.–17 A.D.) was a man of vivid imagination and high poetic temperament, but frivolous and self-indulgent. He was a wonderful story-teller, and the elegance and grace of expression combined with the easy and skilful handling of the metres constitute Ovid's peculiar charm, but these very gifts of nature prevent him from taking the highest rank, for the labor of polishing was irksome to him. We have the following poems: ‹Epistulæ› (or ‹Heroides›), 21 imaginary love letters by men and women in the heroic age, in elegiac metre; ‹Amores,› in three books, chiefly erotic; ‹Ars Amatoria,› in three books, and the ‹Remedia Amoris,› in two books, its counterpart; ‹Medicamina faciei,› only partly extant; ‹Metamorphoseon Libri XV,› in hexameter verse, treats of various myths and their sources after Greek models; ‹Fastorum Libri VI› is a calendar, with an account of the origin of Roman festivals; ‹Tristium Libri V› recounts the troubles of his journey and his wretched plight in a strange land; ‹Epistularum ex Ponto Libri IV› are of a like nature and the ‹Ibis,› a very abusive poem against some unknown enemy, and finally the ‹Halieutica,› a didactic poem, in hexameters, of which only 132 lines are preserved, treating of the fish in the Black Sea. Here may also be mentioned Gratius Faliscus, whose ‹Cynegetica› is in a very imperfect state, and Manilius, whose work on astronomy (or better astrology) is dry but not without interest. The greatest prose writer of this age was T. Livius (59 B.C.–17 A.D.) of Patavium, a man of vivid imagination, generous feelings, possessed with a love of truth and gifted with fine oratorical powers. His language, graceful and elegant, is made more charming by the archaisms and poetic coloring. Livy is a fine master in the portrayal of character and is perhaps the greatest stylist of the Romans. The charge of provincialism is hardly if at all discernible to us. Besides his philosophical and rhetorical works, which are now lost, he wrote the history of Rome in 142 books, ‹Ab Urbe Condita,› of which books I–X and XXI–XLV are preserved, while of the rest we have epitomæ, a very unsatisfactory substitute. Other prose writers of this period are Annæus Seneca (c. 54 B.C.–36 A.D.), a writer on rhetorical subjects, Pomponius Trogus, who wrote a universal history in 44 books, of which a compendium was made by Justinus, and Vitruvius Pollio, from whom we have ‹De Architectura Libri X.› In law, we may mention S. Sulpicius Rufus, A. Ofilius, M. Antonius Labes and C. Ateius Capito. In grammar and philology, P. Nigidius Figulus, who, besides his work on theology and natural sciences, wrote 30 books, ‹Commentarii Grammatici›; M. Verrius Flaccus, author of ‹Fasti› and ‹De Verborum Significatu,› and Iulius Hyginus, who wrote on history, geography, agriculture, astronomy, etc., commentaries on Virgil and 277 fables.

IV. Silver Age.— C. Velleius Paterculus (18 B.C.–31 A.D.), the court historian under Tiberius, wrote an ‹Abridgment of Roman History,› in two books, classical in vocabulary, but exaggerated and artificial in style. Valerius Maximus (fl. A.D. 26) was not an historian, but a compiler, and his ‹Factorum et Dictorum Memorabilium Libri IX,› without taste and sometimes without sense, seems to be a collection of models for rhetoricians. Much more important is A. Cornelius Celsus (fl. A.D. 50), the scientist, of whose encyclopædia we have still extant the eight books on medicine. Here also belongs Phædrus, whose 92 fables in imitation of Æsop are good both as to metre and style. By far the most important writer of this time is L. Annæus Seneca (4 B.C.–65 A.D.), poet and philosopher, who wrote on numerous subjects in a striking and brilliant, but highly artificial style. Besides many works known only by name, we have ‹Dialogi XII,› on various topics; ‹De Beneficiis,› in four books; ‹Naturales Quæstiones,› in seven books; ‹De Clementia,› in two books, and ‹Apolocyntosis,› a bitter satire on the Emperor Claudius, and ‹Epistulæ Morales ad Lucilium,› 124 letters on moral subjects, abounding in saws and maxims. The correspondence with Saint Paul is spurious, but there is now little doubt that the tragedies ascribed to him are genuine. Q. Curtius Rufus (fl. A.D 50) wrote ‹Historiæ Alexandri Magni Libri X,› of which books I and II are lost; not a great work, though at times vivid and dramatic, resembling Livy in the words and phraseology, but Seneca in the form of the sentences. Here may also be mentioned M. Columella, whose work, ‹De Re Rustica Libri XII,› shows considerable technical knowledge and good taste, and Pomponius Mela, whose ‹De Situ Urbis,› in three books, reflects Seneca's style; A. Persius Flaccus (34–62 A.D.), the Stoic, whose six satires have been much admired on account of their ethical value. M. Annæus Lucanus (39–65 A.D.) wrote numerous poems, of which only 10 books of the ‹Pharsalia› have reached us. This work has some fine passages, but the style is highly artificial like Seneca's, his uncle. To Petronius Arbiter is ascribed the satirical novel, originally in 20 books, of which only fragments are now extant, and of these the 'Cena Trimalchionis,' a coarse, but witty description of a banquet given by a rich upstart. C. Plinius Secundus, Pliny the Elder (23–79 A.D.), a naval officer, wrote on history, tactics, grammar, rhetoric, etc., but the only work that we have is his 'Naturalis Historia,' in 37 books, which is a compilation from numerous works, rich in learning, but dry and often crude in style. C. Valerius Flaccus, under Vespasian, wrote 'Argonautica,' in eight books, after the manner of Apollonius Rhodius, in a highly artificial and rhetorical style, which is often obscure. C. Silius Italicus (25–101 A.D.), under Domitian, wrote 'Punica,' in 17 books, on the Second Punic War, imitating Livy in matter and Virgil in style. From P. Papinius Statius (45–96 A.D.) we have the incomplete poem, 'Achilleis,' in one and a half books, 'Thebais,' in a highly florid and artificial style, rich in mythological lore, and the 'Silvæ,' in five books, consisting of 32 pieces, in various metres and of much greater interest than the two preceding poems. Of M. Valerius Martialis (c. 40–120 A.D.) we have 1,555 epigrams, in various metres, full of wit and scathing sarcasm, but often coarse and obscene. M. Fabius Quintilianus (35–95 A.D.), the great teacher of rhetoric, has always enjoyed a wide reputation. The only work that has come to us is his 'Institutio Oratoria,' in 12 books, outlining the complete course for instructing an orator, making an interesting and valuable book. Quintilian's aim was to bring back the old style, especially Cicero's, and though he condemns in vigorous language the artificial style of his day, especially of Seneca, the philosopher, he was unable to free himself entirely from the stylistic defects of his age. Sextus Iulius Frontinus (40–103 A.D.) was a distinguished mathematical writer, of whose work on 'Surveying' only extracts are extant; we also have his 'Strategemata,' in three books, and 'De Aquis Urbis Romæ,' valuable for the information it contains. The greatest poet of the period is Dec. Iunius Iuvenalis (56–140 A.D.), of whom we have 16 satires in five books, in which he satirizes the hideous vices of his time in a most interesting and realistic manner. His language is forcible and drastic, though often obscure. The most distinguished prose writer of the decline is P. Cornelius Tacitus (55–119 A.D.), whose extant works are as follows: 'Dialogus de Oratoribus,' considered doubtful by some on account of its diffuse and florid style; 'Agricola,' a very valuable and sympathetic biography of his father-in-law, in rhetorical style; 'Germania,' an historical monograph, also in rhetorical style, a valuable contribution to our knowledge of the ancient Germans; 'Historiæ,' originally in 14 books, of which only I–IV and the first part of V are extant, contains an account of the Flavian dynasty; 'Annales,' or more correctly 'Ab Excessu Divi Augusti Liber,' originally in 16 books, of which only I–IV and XII–XV are extant entire, and parts of V, VI, XI and XVI, which treat of the Julian dynasty. Tacitus was an earnest and conscientious historian, a careful student of his authorities, and tried to be impartial. He shows the influence of Cicero and Sallust in his style, which is now grave and compact, now sonorous and grand, very irregular at times, but always energetic. A charming writer of this time is C. Plinius Cæcilius Secundus (62–113 A.D.), Pliny the Younger, nephew and adopted son of Pliny the Elder. He was a distinguished advocate and speaker of his day. Of his speeches we have the 'Panegyricus,' in which he thanks Trajan for the consulship. Far more delightful and interesting are his 'Epistulæ,' in nine books, written with a view to publication and so lacking the freshness of Cicero's letters, but forming a valuable help to understanding the temper and condition of his time; a tenth book contains the correspondence between Pliny and Trajan, when Pliny was governor of Bithynia. The style is smooth, equable and fluent.

V. Period of Decline.— The most important writer of this age is Suetonius, whose 'Lives of the Twelve Cæsars' and some fragments of his other works have come down to us. Here also belongs Florus, with his tasteless 'Epitome of Roman History,' the grammarian Terentius Scaurus, Fronto, the rhetorician; the jurists Ulpius, Marcellus and Gaius, Aulus Gellius, whose 'Noctes Atticæ' contains valuable material; Apuleius, a voluminous writer of prose and verse, whose 'Metamorphoseon Libri XI' is best known; the Christian writers Minucius Felix, who imitated Cicero and Seneca, and Tertullianus, author of the 'Apologeticus,' and the grammarians, Acron and Porphyrion, authors of commentaries on the classic poets, and Terentianus Maurus, the metrician. In the 3d century we find Ulpianus and Paulus, the jurists, Cyprianus, Arnobius and Lactantius, the Christian writers, of whom the last is the Cicero of the Christian writers; and Nonius Marcellus, the lexicographer. In the 4th century worthy of mention are the grammarians and commentators, Victorinus, Donatus and Servius, Eutropius and Ammianus Marcellinus, the historians; the poets, Ausonius and Prudentius, a Christian poet; Damasus and Ambrosius, writers of Christian hymns, and Claudius, a brilliant poet for his time; and the Christian writers, Hieronymus (Saint Jerome), who translated the Bible, and Augustinus (Saint Augustine), the best of the late Christian writers. With these it is perhaps best to close this sketch of Roman literature, though the writing of Latin continued for many centuries after these.

See also ASSYRIAN LITERATURE; EGYPTIAN LITERATURE; JEWISH LITERATURE; CHINESE LITERATURE; PERSIAN LITERATURE; SANSKRIT LITERATURE; VEDIC LITERATURE; LATIN LITERATURE; LATIN WRITERS; the biographies of the classical authors mentioned; and the articles DRAMA; LITERATURE; POETRY.

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Charles W. Bain,
Late Professor of Ancient Languages and Literature, University of South Carolina.

CLASSICAL TIMES, Democracy in. See Democracy, History of.

CLASSIFICATION OF LANGUAGES. See Language, Science of.

CLASSIFICATION OF VOTERS. See Voters, Vote, Voting.

CLASTIC, a term used to describe rocks that consist of particles or fragments of other rocks, mechanical sediments, in contrast to those of chemical or organic origin. They may be either terrestrial or marine. Sandstones, shales and conglomerates are clastic, while most limestones are not.

CLAUDE, klōd, **Jean,** French theologian: b. La Sauvetat, near Agenois, 1619; d. The Hague, 13 Jan. 1687. He studied at Montauban, officiated as pastor at Nîmes and Montpellier, but owing to his opposition to the government scheme for the reunion of the Protestants and Roman Catholic was interdicted from preaching. The controversial abilities of Claude rendered him formidable and obnoxious to the Catholic party. In 1662 he obtained a post at Montauban, but was forced to relinquish it. He went to Paris, where he received an appointment to the pastorate of Charenton (1666). On the very morning on which the revocation of the Edict of Nantes was registered at Paris, he was ordered to leave France within 24 hours. He retired to Holland, where he was received by the Prince of Orange, who settled a pension on him and allowed him to preach at The Hague. The most important of his works is his ‘Défense de la réformation’ (1673, Eng. trans., 1815). He also published a well-known ‘Traité de la composition d'un sermon.’ He wrote against Arnauld and Nicole on the doctrine of transubstantiation, and in 1678 held a discussion with Bossuet in presence of Mlle. de Duras, a Protestant lady connected with the court, and niece of Turenne, who wished to review the grounds of her faith by hearing their arguments. Bossuet published an account of the conference, which was answered by Claude. His son published ‘Œuvres posthumes de Jean Claude’ (5 vols., Amsterdam 1688). Consult Rotolph, A., ‘Abrégé de la vie de M. Claude’ (Amsterdam 1687).

CLAUDE LORRAINE, klōd lŏr-rān̄, or **LORRAIN,** so-called, French landscape painter and etcher: b. Chamagne in Lorraine, France, 1600; d. Rome, 25 Nov. 1682. His real name was Claude Gelée: he was called *Lorraine* from the province in which he was born. When 12 years old it is said he went to live with his brother, an engraver in wood, at Freiburg. Afterward a relation of his took him to Rome, where the sight of some paintings of the Flemish painter, Godfrey Waels, who was then living in Italy, enchanted him so much that he traveled to Naples to study with the artist. Returning to Rome after two years, he was employed by the landscape-painter Agostino Tassi, as a color-grinder and otherwise. He is next said to have studied the paintings of Giorgione and Titian, whereby his coloring and chiaroscuro were greatly improved. After making a journey into his native country, and residing for some time at Nancy, he settled in 1627 in Rome. Here he attracted the notice of Cardinal Bentivoglio, and was introduced by him to Pope Urban VIII, who gave him orders for four paintings. His position being now assured, he had many other eminent patrons, and was enabled to live much at his ease. The principal galleries of England, France, Spain, Russia and Germany are adorned with his productions. The public and private galleries of England are richest in these works, a number being in the National Gallery, others at Dulwich, at Windsor Castle and elsewhere. Claude possessed the greatest power of invention, by which he gave an inexhaustible variety to his paintings, united with an ardent and persevering study of nature. The truth with which he portrays the effect of the sun in every part of the day, soft breezes playing through the tops of the trees, and all the delicate beauties of nature, is surprising; and all his rivals fell far short of equaling the dewy humidity which he threw over dark, shadowy places. His figures are poor, and he used to say—«I sell my landscapes, and give my figures into the bargain.» In a great number of his paintings the figures are the work of other artists. Claude most frequently chooses views in which the eye loses itself in agreeable prospects, without being able to define their limits. He often introduces grand architectural structures, and makes his landscapes the scenes of mythological and historical events. Claude himself made a collection of some 200 drawings of his pictures. This record, now in the collection of the Duke of Devonshire, is known as the ‘Liber Veritatis.’ Consult Dilke, Lady E. F., ‘Claude Lorrain, sa vie et ses œuvres’ (Paris 1884); Dullea, ‘Claude Gelée, le Lorrain’ (London 1887); Grahame, G., ‘Claude Lorrain, Painter and Etcher’ (London 1895); Earlom, R., ‘Liber Veritatis’ (London 1819).

CLAUDIANUS, klâ-dĭ-ā'nŭs, **CLAUDIUS** (commonly known as **CLAUDIAN**), Roman poet: b. Alexandria about 365 A.D.; d. about 408. He went to Rome in 395 A.D., where his poems gained him such renown that a statue was erected to his honor in the forum of Trajan. Besides several panegyrical poems on Honorius, Stilicho and others, we possess his epic, the ‘Rape of Proserpine,’ an unfinished Gigantomachia, idyls, epigrams, epistles and occasional poems. Claudian, whose native tongue was Greek, possessed a remarkable command of the Latin language, and displays poetic powers of a high character, brilliancy of diction, truth of description and richness of illustration. The best editions of his works are those of Gesner (1759); Burmann (1760); Jeep (1876–79); Koch (1893). There is a metrical translation of his works by A. Hawkins (1817). Consult Hodgkin, ‘Claudian: The Last of the Roman Poets’ (London 1875); Creet, C. H., ‘Rome's Past in the Poems of Claudian’ (in the *Classical Journal,* Vol. VI, pp. 108–15, 1910).

CLAUDIUS, klâ'dĭ-ŭs, the name of a distinguished Roman family which under its head, Attus Clausus, a Sabine, settled at Rome about 504 B.C., and soon branched off into a patrician and a plebeian stock, the former known as the «Pulchri,» the latter the «Marcelli.» 1. Attus, admitted among the patricians, changed his name to Appius Claudius. 2. Claudius, Appius, surnamed Crassus, was consul in 471 and 451 and also one of the decemvirs. His amour with the daughter of the plebeian centurion Virginius resulted in a plebeian insurrection and the resignation of the decemvirs. The patrician Claudii were characterized throughout their whole history by their haughty and tyrannical bearing, displayed particularly toward the plebeians; while the plebeian branch were equally distinguished for the resolute assertion of the rights of their order. The patrician Claudii counted among their members 28 consuls, 5 dictators, 7 censors, etc. (See Appius Claudius Crassus). The plebian form of the name was Clodius.

CLAUDIUS I, or, in full, **TIBERIUS CLAUDIUS DRUSUS NERO GERMANICUS**, 4th Roman emperor: b. Lyons, 10 B.C.; d. 54 A.D. He was the youngest son of the elder Claudius Drusus Nero and Antonia the younger, the daughter of Augustus' sister. His early education was left to women and slaves; owing to his ill health it was thought he would never become a robust man. He accordingly escaped the hostile notice of Caligula, and availed himself of the leisure and more or less enforced retirement to compose extensive literary works in Latin and Greek, which have unfortunately not been preserved. Among other works he wrote a Roman history, embracing the period from the death of Cæsar to his own time. After the murder of Caligula, the body-guard, who were ransacking the palace, discovered him secreted in a corner, dragged him out and proclaimed him emperor (41 A.D.). The Senate, who had determined on the restoration of the republic, were forced to confirm the appointment. Claudius, suddenly transferred from retirement and oppression to uncontrolled power, distinguished the beginning of his reign by some praiseworthy acts; he recalled the exiles and restored their estates to them; embellished Rome and erected several large buildings for the public good. He made Mauretania a Roman province; his armies fought successfully against the Germans, and kept possession of several strong places in Britain. But while he was living in comparative retirement (for he never wholly abandoned the practice of earlier years), his wives, particularly the infamous Messalina, together with his freedmen, administered the government, sold offices and places of honor and committed the greatest atrocities unpunished. He died of poison administered by his fourth wife, Agrippina (mother of Nero), who entertained the suspicion that her husband (and uncle) might otherwise live long enough to withdraw his appointment of Nero as successor to the Imperial power. Claudius was deified in due course. His deification was the cause of Seneca's pasquinade entitled ‘Apocolocyntosis.’

CLAUDIUS II (Marcus Aurelius Flavius), surnamed Gothicus, Roman emperor: b. Illyria 214 A.D.; d. of the pest at Sirmium 270 A.D. He was raised to the throne on the death of Gallienus, in 268, and by his splendid victories over the Alemanni and the Goths, he proved himself worthy of the confidence of his soldiers, who made him emperor because he was a good military leader.

CLAUDIUS, Appius, surnamed **CÆCUS** («the blind»), a patrician of Rome, who, when chosen to the censorship in 312 B.C., endeavored to break down class-distinctions by nominating men of humble birth as candidates for senatorial rank. He performed an important service for all the public by the construction of the road (Appian Way) and the aqueduct which bear his name, though he is said to have procured the removal of his colleagues from office that he might be able to appropriate the whole honor of these works to himself. In his old age he became blind; but when Cineas, the deputy of Pyrrhus (280 B.C.), had gained over the Senate, which was on the point of accepting peace on the terms offered by him, Appius caused himself to be led into the Senate-house, and in a celebrated speech, of which Cicero speaks in the highest terms, succeeded in persuading the Senate to resolve that they would listen to no proposals of peace in which the evacuation of Italy was not made an essential condition. From his two sons spring the two best known branches of the Claudian family, the one distinguished by the surname of Pulcher and the other by that of Nero.

CLAUDIUS, Matthias, mat-tē'ās klow'dĭ-ŭs, German poet and prose writer: b. Rheinfeld, 15 Aug. 1740; d. Hamburg, 21 Jan. 1815. In 1775–1812 he made a collection of his compositions, which had appeared in the *Wandsbeck Messenger* and other periodicals, with the addition of some which had not been printed, and gave the collection the title ‘Asmus omnia sua Secum Portans,’ or ‘Complete

Works of the Wandsbeck Messenger.’ His works are written in a natural, and often humorous style, and support the cause of good morals, benevolence, patriotism and piety, while they attack folly and vice with the weapons of ridicule and scorn. Many of his songs have been set to music and have become a part of the national melodies. He also made a number of translations from the English and French.

CLAUS, klows, **Karl Friedrich Wilhelm,** German zoölogist: b. Cassel 1835; d. 1899. He studied at Giessen under Leuckart. He was appointed professor of zoölogy in Marburg in 1863, in Göttingen in 1870 and Vienna in 1873. He was also director of the Triest Zoölogical Garden. His ‘Textbook of Zoölogy’ made him widely known. His published works include ‘Beiträge zur Kenntnis der Ostracoden’ (1868); ‘Grundzüge der Zoölogie’ (1869); ‘Ueber den Bau und die Entwickelung der Cumaceen’ (1870); ‘Die Metamorphose der Squilliden’ (1872); ‘Lehrbuch der Zoölogie’ (6th ed., 1897; Eng. trans., London 1897).

CLAUSEL, Bertrand, klō-zĕl, French marshal: b. Mirepoix, 12 Dec. 1773; d. near Toulouse, 21 April 1842. After gaining a high reputation by his services on the Pyrenees, in Haiti, Italy and Dalmatia, he accompanied Junot and Massena to Spain in 1810. He laid siege to Ciudad Rodrigo, and was wounded at Salamanca. By his skill and conduct the army of Portugal was preserved and led into Spain. In 1813 Napoleon rewarded his valor by conferring on him the chief command of the forces in the north of Spain. On the restoration of the Bourbons he came to the United States, and lived here for a long time in retirement at Mobile where he wrote his ‘Exposé justificatif.’ But when Charles X was overthrown in 1830 he received from Louis Philippe the command of the French troops in Algeria, which he retained till 1836, when he resigned in consequence of the defeat he had sustained at Constantine, and returned to France. Consult Clausel, ‘Explications du Maréchal Clausel’ (Paris 1837); Duchesse d'Abrante's ‘Mémoires’; Blanc, L., ‘Histoire de dix ans’; DeVaulabelle, ‘Histoire des deux restaurations’; and the article on ‘Clausel’ in ‘La Grande Encyclopédie.’

CLAUSEN, klow'sĕn, **George,** English artist: b. London 1852. After studying at South Kensington 1867–73, he was for some time in Paris under Bouguereau and Fleury and subsequently visited Holland and Belgium, exhibiting at the Royal Academy in 1876, ‘High Mass at a Zuyder Zee Village.’ Besides many works on Dutch themes he has painted ‘Laborers at Dinner’; ‘Brown Eyes’; ‘Evening Song’; ‘Turning the Plow.’ He became a member of the Royal Academy in 1908.

CLAUSEN, Thomas, German astronomer: b. Nübel, Schleswig, 1801; d. 1885. From his early years he devoted himself to astronomical studies and was for several years assistant at the Altona Observatory. In 1842–72 he was engaged, first as observer, afterward director, at the Dorpat (Yuryer) Observatory. He made many important contributions to astronomical science and made extensive calculations relating to the paths of comets.

CLAUSEWITZ, klow'zĕ-vĭts, **Karl von,** Prussian military officer: b. Burg, 1 June 1780; d. Breslau, 16 Nov. 1831. His family settled in Germany at the end of the previous century. He first saw service in the Rhine campaigns of 1793–94, receiving his commission at the siege of Mainz. After his return from garrison duty he began to study and finally entered the Berlin Academy for young officers, where he came greatly under the influence of Scharnhorst. In 1803 he was made aide-de-camp to Prince August and served in the campaign of Jena (1806). He was captured with the prince at Prenzlau and was for two years a prisoner. Returning to Prussia in 1809, he became departmental chief in the Ministry of War; teacher in the military school, instructor to the Crown Prince, and assisted Scharnhorst in the reorganization of the Prussian army. In the Russian War of 1812 he served as adjutant to General Phull and organized the Landwehr of East Prussia. He was present also in the Waterloo campaign as chief of General Thielmann's staff. In 1818 he was appointed head of the Allgemeine Kriegsschule. In 1819 he was chief of staff of Field-Marshal Gneisenau, after the dissolution of whose army he resumed his artillery duties. He died of cholera. His works were edited by his widow (Berlin 1832–37, 1874). They include his masterpiece, ‘Vom Kriege’ (in the first 3 vols.), an exposition of the philosophy of war. He is the founder of modern strategic science. English and French translations have been published. The remaining volumes cover the military history of the period. He wrote also a life of Scharnhorst and letters. Consult Schwartz, ‘Leben des Generals von Clausewitz und der Frau Marie von Clausewitz’ (2 vols., Berlin 1877); von Meerheimb, ‘Karl von Clausewitz’ (Berlin 1875); Bernhardi, ‘Leben des Generals von Clausewitz’ (10th Supplement, *Militärisches Wochenblatt*, 1878).

CLAUSIUS, klow'zĕ-ŭs, **Rudolf,** German physicist: b. Köslin, Pomerania, 2 Jan. 1822; d. Bonn, 24 Aug. 1888. He studied at Berlin and afterward lectured on natural philosophy as *privat-docent* at Berlin, and as professor at the Zürich Polytechnic School. In 1869 he was appointed to the chair of natural philosophy at Bonn. He was elected a foreign member of the Royal Society in 1868, and in 1879 was given its highest honor, the Copley medal. His scientific labors cover parts of the field of optics and of electricity, but his especial work was his contribution to the science of thermo-dynamics, the honor of establishing which on a scientific basis he divides with Rankine and Thomson. To his research is due the discovery of the second law of this science that "heat cannot of itself pass from a colder to a hotter body." His studies in electrolysis are also important, particularly his theory that a part of the ions are free to unite with other ions and are not in complete union. These uncombined ions are brought together under the action of the current at the anode and cathode. His mathematical methods he also applied to the theory of the steam-engine, the dynamical or kinetic theory of gases, and to electricity and electrodynamics. His great works are ‘Die mechanische Wärmetheorie’ (1876); ‘Die Potentialfunktion und das Potential’ (1859); and

'Über das Wesen der Wärme, verglichen mit Licht und Schall' (1857). For a biography consult Riecke, 'Rudolf Clausis' (Göttingen 1889).

CLAUSON-KAAS, klow'zôn-käs', **Adolph von,** Danish educator: b. near Altona, Holstein, 1826; d. 1906. He joined the Danish cavalry but resigned to devote himself to the promotion of education. He founded the Danish Clubs for Home Industry in 1870 and lectured on manual training in several of the larger European cities in 1873–78. He advocated the revival of working schools for boys, aiming at training the hand and eye along with the mind. He conducted training schools in Saxony and instituted courses in drawing and modeling in the institute for the blind at Dresden.

CLAUSS-SZAVARDY, Wilhelmina, Austrian pianist: b Prague, 1834; d. 1907. She received her musical education at the Proksch Institute of Prague. She made a tour of Germany in 1849 and came under the notice of Berlioz at Paris, where she had little success at first. Later under the patronage of Madame Ungher-Sabastier she attained the fullest measure of success and thereafter toured through Europe. She was especially successful as an interpreter of Bach and Beethoven. She married the author, Frederick Szavardy in 1857.

CLAUSTHAL, klows'täl, Prussia, mining district and town in the province of Hanover. It is situated on the Zellerbach, 26 miles northeast of Göttingen. It stands in a bleak district, on the top and slopes of a hill, about 1,800 feet above the sea. It is regularly laid out, having been frequently burned down and rebuilt, but the houses are generally of wood. It contains a government mining school, with a good collection of models of mines and minerals, a library of 40,000 volumes, a mint at which 14,000 silver dollars are coined weekly, and over 600 gold ducats yearly, and it has also a church, courthouse and gymnasium. The mines of Clausthal yield silver, lead, copper, iron and zinc, and are among the most valuable and productive in Germany. They are owned and operated by the Prussian government. One of the mines reaches 500 feet below the level of the Baltic, and is drained by a tunnel cut through the mountain to a distance of six miles. The machinery of the mines is worked by water power, and every stream in the vicinity is carefully appropriated to this purpose; the various canals, which extend from mill to mill throughout the mines, have an aggregate length of 125 miles. These mines have been worked since the 11th century. The mines furnish employment to the greater portion of the men, and a number of knitting mills give employment to the women. Pop. 8,266.

CLAVA CORONÆ, klā'vạ kō'rō-nī («the Key of the Crown»), one of the names given to the star Alpha Coronæ Borealis, the brightest in the Northern Crown. The more common name is that of Arabic derivation, Alphecca.

CLAVARIA, klā-vā'rĭ-ạ, a genus of fungi, belonging to the Hymenomycetes, many of them edible. They are known in general as the coral fungi, as their fleshy sporophores are often like branching coral in form. The spores are produced over the whole surface of the branches. One species (*C. botrytis*), growing in Germany, is a common article of food. It has a sweetish taste, and is said by Liebig to contain mannite (q.v.). Another species (*C. flava*) is used in the same way. Another species is the goat's-beard fungus. See Fungi, *Moulds*.

CLAVERACK, klăv'ẽr-ạk, N. Y., town in Columbia County, on the Boston and Albany Railroad, about 30 miles south of Albany. The town was settled in 1660, and has a Dutch Reformed Church building dating from 1767, and a courthouse erected in 1784, a home for crippled children, public library and Fresh Air Home for Children. The chief industries are agriculture and the manufacture of flour and farm implements. The town is the seat of a well-known school called the Hudson River Institute, established in 1854. It was organized as a town in 1778 and was the county-seat from 1786 to 1806. The government is administered by town meetings held every two years. Pop. 4,114.

CLAVERHOUSE, kläv'er-ŭs. See Graham, John.

CLAVERINGS, The, a novel of contemporary English life, by Anthony Trollope, published 1867.

CLAVICHORD, a keyed musical instrument, now out of use, somewhat in the form of a spinet, the strings of which are supported by five bridges. One distinction in the clavichord is that the strings are covered with pieces of cloth, which render the sound sweeter, and at the same time deaden it, so as to prevent its being heard at any considerable distance. On this account it was formerly much used by the nuns, who could practise on it without disturbing the dormitory. It is sometimes called the «dumb spinet.» It was used in Germany until the beginning of the 19th century. Bach used it in preference to the pianoforte; Mozart used it in composition and Beethoven also preferred it. Several clavichords were manufactured as late as 1896 for the revival of ancient music by Mr. Arnold Dolmetsch. (See Pianoforte). Consult Hopkins, A. J., 'Old Keyboard Instruments' (London 1887); Krebs, K., 'Die besaiteten Klavierinstrumente bis zum Anfang des 17 Jahrhunderts' (Leipzig 1892); Goehlinger, 'Geschichte des Klavichords' (Basel 1910).

CLAVICLE, or COLLAR-BONE, a bone situated immediately above the first rib, stretching from the upper border of the manubrium of the sternum, outward and backward to the acromium process of the scapula or shoulder-blade. It connects the upper limb, the arm, with the trunk, and is so fastened that while its inner end rests on the sternum and cartilage of the first rib the outer end is associated with the scapula, supporting it firmly in its varied positions and preventing it from falling forward from the chest. The clavicle is a long bone, and in men is much heavier than in women. It is absent or imperfectly developed in those animals which do not use lateral movements of the fore-limbs and is very much exaggerated or modified in animals such as birds, that exercise the arms very extensively. The clavicle is very frequently broken in children from the results of a direct fall, and as it does not always occasion a marked deformity the diagnosis is at times difficult. Consult Morris, 'Human Anatomy' (3d ed.); Gerrish, 'Text-Book of Anatomy by American Authors,’ 2d ed.; Spalteholz, ‘Anatomy.’ See SHOULDER-JOINT.

CLAVIGERO, klā-vē-hā'rō, **Francisco Xavier Saverio,** Mexican historian: b. Vera Cruz, Mexico, 9 Sept. 1731; d. Bologna, Italy, 2 April 1787. He was educated as an ecclesiastic, and resided 36 years in the provinces of New Spain, where he acquired the languages of the Mexicans and other indigenous nations, collected many of their traditions and studied their historical paintings and other monuments of antiquity. The first of his researches was a ‘History of Mexico,’ written in Italian, of which an English translation was published in 1787 by C. Cullen (2d ed., 1807). This is a most comprehensive work, affording a great deal of information relative to the natural and civil history, antiquities and religion of Mexico; but it displays more industry than judgment on the part of the author. On the suppression of the Jesuits by the Spanish government in 1767 Clavigero went to Italy, the Pope assigning him a residence in Ferrara and then in Bologna, where he established a literary academy. Consult Castro, Ag., ‘Elogio del P.-Fr. Clavigero’ (Ferrara 1787).

CLAVIJO Y FAJARDO, José, klā-vē'hō ē fā-hār'dō, Spanish publicist: b. Lanzarote, Canary Islands, 1730; d. 1806. He lived in Madrid, where he had the reputation of an intelligent scholar, and published a journal, *El Pensador,* and instituted a campaign against the public performance of «autos sacramentales,» securing their prohibition in 1765. For more than 20 years he superintended the publication of the ‘Mercurio Historico y Politico de Madrid,’ with which he had been entrusted as early as 1773. He likewise translated Buffon's ‘Natural History’ into Spanish (1785–90). He was vice-director of the Cabinet of Natural History and director of the Teatro de los Sitios when he died. His love affair with the sister of Beaumarchais won him the life-long enmity of the latter. Clavijo was of a mild disposition, pleasing manners and a clear understanding. He had also an abundance of courage, aggressiveness and the gift of pungent expression which are the equipment of a good journalist. Goethe founded his tragedy ‘Clavigo’ on Beaumarchais' story.

CLAVIS, klā'vĭs (Lat. «key»), a drawing, index, etc., which serves as a guide to the understanding of another work; for instance, *clavis Ciceronia, clavis Homerica,* etc.

CLAWS, sharp hardenings of the skin at the end of the limbs of animals. The term is often applied to the chelæ and similar structures at the end of arthropod limbs, but is best restricted to the horny nails found at the end of the digits in most reptiles, on the toes, and often on the thumb and first finger, of birds, and seen in perfection in many mammals, such as the carnivores, insectivores, rodents, edentates and others, where the nails are sharp and serve for scratching and clinging. See HOOF; HORN; NAIL.

CLAXTON, Alexander, American commodore: b. Maryland about 1790; d. Talcahuana, Chile, 7 March 1841. He entered the navy as midshipman in 1806, was promoted to a lieutenancy in 1813 and served on the sloop of war *Wasp* in her action with the British sloop of war *Frolic,* on 18 Oct. 1812. He was promoted to the rank of master commandant in March 1820, and to that of captain in 1831, performing much active service in both grades. He died while in command of the squadron in the Pacific Ocean.

CLAXTON, Kate (STEVENSON), American actress: b. Somerville, N. J., 1850. She was the daughter of Spencer Wallace Cone, and was married to Charles Stevenson in 1878. She made her début in Chicago with Miss Lotta in 1870, and in the same year joined Daly's Theatre Company, but her success dates from 1873, when she acted Mathilda in ‘Led Astray.’ As Louise in ‘The Two Orphans’ she attained great celebrity. She was playing the part at the Brooklyn Theatre when, on the night of 5 Dec. 1876, that structure was destroyed by fire with great loss of life. She is considered one of the best emotional actresses of her time. Her first starring tour was in 1876.

CLAXTON, Philander Priestly, American educator: b. Bedford County, Tenn., 28 Sept. 1862. He was graduated at the University of Tennessee in 1882 and studied also at Johns Hopkins 1884–85. In 1885–86 he studied education and school administration in Germany. For several years he was superintendent of schools in North Carolina. In 1896 he became professor of pedagogy and director of the Practice and Observation School at the North Carolina State Normal and Industrial College. In 1902–11 he was professor of secondary education and from 1906–11 inspector of high schools at the University of Tennessee. In 1911 he was appointed United States commissioner of education. He is the author of many addresses and published articles on education. He edited the North Carolina *Journal of Education* in 1897–1901 and the *Atlantic Educational Journal* in 1901–03. In 1902–11 he was superintendent of the Summer School of the South.

CLAXTON, Thomas Folkes, English astronomer: b. London, 29 April 1874. He was educated at the Colfe Grammar School and joined the Greenwich Royal Observatory in 1890. In 1895 he became assistant director of the Royal Alfred Observatory, Mauritius, and was made director the following year. In 1912 he was appointed director of the Royal Observatory at Hongkong. His publications include ‘Annual Magnetic and Meteorological Observations, Mauritius’ (1896–1910); ‘Seismological Observations’ (1898–1910); ‘Magnetic Survey, Pamplemousses’ (in ‘Proceedings’ of the Royal Society, Vol. LXXVI, 1905); ‘Climate of Pamplemousses’; and several papers on cyclones in the south Indian Ocean.

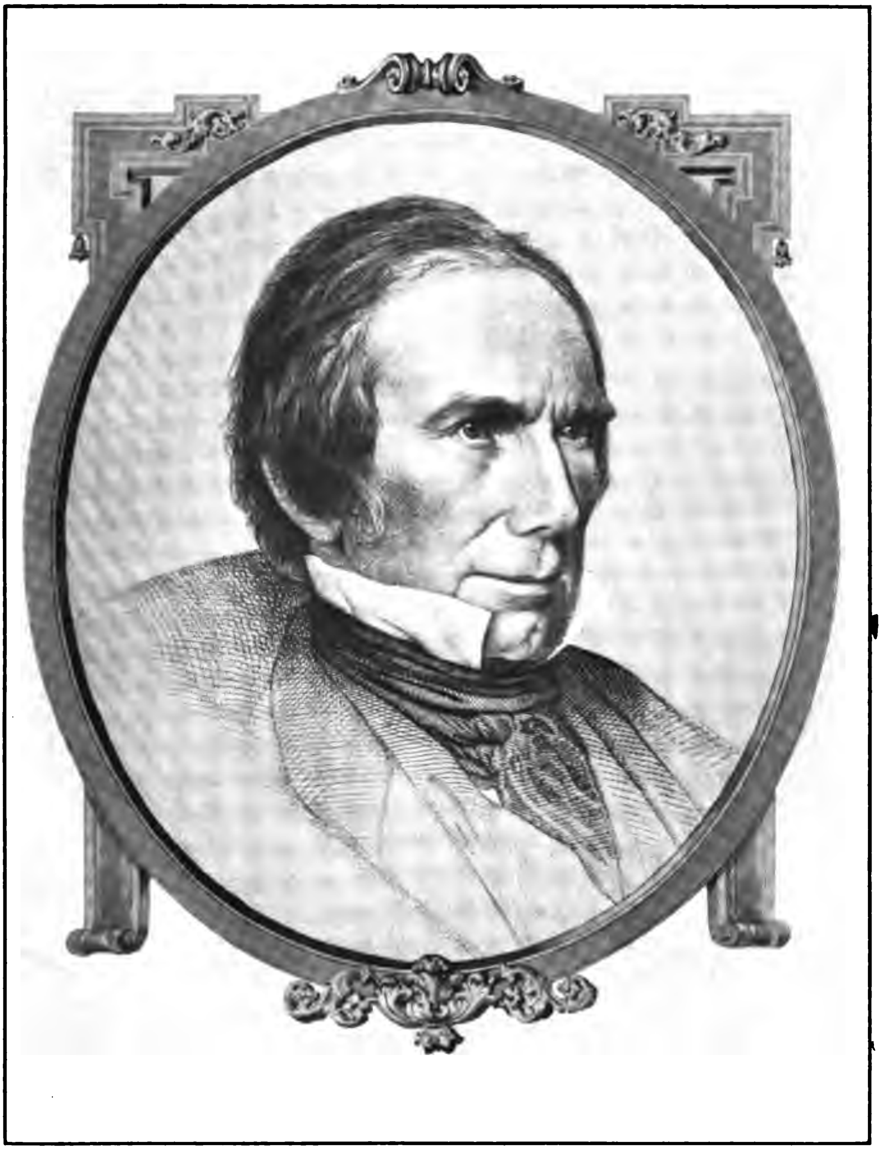
CLAY, Cassius Marcellus, American diplomatist: b. Madison County, Ky., 19 Oct. 1810; d. 21 July 1903. He was graduated at Yale in 1832, and three years later was elected to the legislature of Kentucky and again in 1837 and 1840. The improved jury system and the common school system of Kentucky are in large measure due to his efforts while in the legislature. He denounced the scheme of Texan annexation as designed for the extension of slavery, and in 1844 traversed the Northern States, addressing immense audiences in favor of the Whig presidential candidate. On 3 June 1845 he issued in Lexington, Ky., the first number of the *True American*, a weekly newspaper, devoted to the overthrow of slavery in that State. It aroused indignant opposition, and in August following his press was seized by a mob and sent to Cincinnati. He was threatened by public resolution with assassination, but revived his paper, printing it in Cincinnati and publishing it in Lexington. Public sentiment came gradually to support the principle of the freedom of the press, and Clay was able to keep an anti-slavery journal in the field, first at Lexington and afterward at Louisville. He served in the Mexican War, was an opponent of slavery and supported Lincoln for the presidency. From 1862 to 1869 he was Minister to Russia. In 1896 he supported the «gold» Democratic ticket. Consult Greeley, Horace (editor), ‘Life, Memoirs, Writings and Speeches of Cassius Marcellus Clay’ (2 vols., Cincinnati 1886).

CLAY, Clermont Claiborne, American senator: b. Huntsville, Ala., 1819; d. there, 3 Jan. 1882. He was graduated at the University of Alabama in 1835, and after studying law in the University of Virginia was admitted to the bar in 1840. He was elected to the Alabama legislature, 1842, 1844 and 1845; was judge of the Madison County Court 1846–48. He was chosen United States senator in 1853, and reelected in 1859, receiving every vote in the legislature. In the Senate he supported the admission of Kansas under the Lecompton resolution, and was an ardent advocate of the State sovereignty doctrine. He was formally expelled in 1861, and became a senator in the Confederate Congress. In 1864 he was a secret agent of the Confederacy in Canada, but in May 1865 gave himself up to the United States authorities and was a fellow prisoner of Jefferson Davis at Fort Monroe. After his release in April 1866 he returned to the practice of law in Huntsville.

CLAY, Frederick, English composer: b. Paris, 3 Aug. 1839; d. Great Marlow, 24 Nov. 1889. He studied music at Paris, and settled in London as a composer for the stage, his most successful production being ‘Lalla Rookh’ (1877). This cantata also contained his most popular song, ‘I'll Sing Thee Songs of Araby’; other songs being ‘She Wandered Down the Mountain Side,’ and ‘The Sands-o’ Dee.’

CLAY, Green, American soldier: b. Powhatan County, Va., 1757; d. Kentucky, 31 Oct. 1826. He was a cousin of Henry Clay (q.v.). He went to Kentucky early in life and there acquired a fortune as a surveyor. He filled many local offices, was a member of the convention that ratified the Federal Constitution, of the Kentucky Constitutional Convention of 1799, and served for many years in the State legislature. On 16 March 1813, Governor Shelby commissioned him a brigadier-general and in May of that year, when General Harrison was besieged by the British at Fort Meigs, on the Maumee River, Clay came to his relief with 3,000 volunteers. He was left in command of the fort and successfully defended it against a combined attack of British and Indians under General Proctor and Tecumseh.

CLAY, Henry, American statesman: b. Hanover County, Va., 12 April 1777; d. Washington, D. C., 29 June 1852. Clay was born in a region of Virginia which was already declining and from which people were constantly emigrating. His parents were, however, well-to-do owners of slaves. The father, John Clay, was a Baptist preacher of local reputation as an orator. The elder Clay died when Henry was four years old, leaving the mother with seven small children. Mrs. Clay married a second time and added six other children to her flock. The stepfather was a gentleman of good social standing and he secured for Henry a position as assistant to the clerk of the Virginia High Court of Chancery, where he came under the immediate influence of Chancellor George Wythe who had been the teacher of Jefferson and John Marshall. With the meagre training common to American boys of that day, young Clay began the study of law under the great master. He was licensed to practise at the Virginia bar in 1797 and almost immediately thereafter he emigrated to Lexington, Ky. He found a hearty welcome in the new community and within a short period he was associated with Thomas Hart, a lawyer and real estate speculator known all over the West. In 1799 he married Lucretia Hart, the daughter of his patron. About the same time he began to take an active interest in public affairs, made speeches and wrote newspaper articles on the slavery question and the famous Kentucky resolutions, thus extending his influence and preparing the way for his election to the legislature in 1803. The issue which brought him into public life was prepared by Felix Grundy who was attacking with wide popular support a Lexington insurance company which had obtained a charter in surreptitious manner to do a banking business. Banks were extremely unpopular in the West in 1803. Clay championed the cause of the local corporation and waged a successful war in its defense. Although the majority of the assembly had been elected specially to annul the charter of the company, Clay defeated that purpose and so discomfited Grundy that he emigrated to Tennessee. Clay was now one of the acknowledged leaders of Kentucky; but he was so ardent a Republican that he fell an easy prey to the blandishments of Aaron Burr who visited Lexington in 1806 seeking recruits for his expedition against Mexico. Clay became sponsor for Burr's patriotism and denounced the activity of the Federalist district attorney who sought to convict the former Vice-President of treason in the United States court. Clay appeared as Burr's counsel without fee and his friends made a hero of the defendant. But toward the end of the year Clay was elected to the United States Senate to fill an unexpired term. On his way to Washington he read the President's proclamation calling upon all men to assist in the arrest and detention of Burr as a conspirator against the country. Immediately Clay and all Kentucky reversed their positions and without loss of popularity to Clay who was again elected to a short term in the Senate in 1808. During this period of service in Washington he advocated the annexation of Canada and denounced the United States bank in unmeasured terms; «he was a democrat of the first fire,» as John Quincy Adams contemptuously confided to his diary. But Clay was already a man of mark and when, in 1811, he was elected by the Lexington district to a seat in the national House of Representatives his career as a statesman began. He was then only 34 years



HENRY CLAY

old and a new member, but he was promptly chosen speaker in preference to older members and recognized parliamentarians. For five vears Clay had urged upon the government the western program: War with England, the immediate invasion of Canada and the suppression of Indian hostilities on the border which were everywhere supposed to be the result of English intrigues. The recent elections had returned men of this way of thinking to Congress from nearly all western and southern districts and Clay was the natural leader of the insurgents. He organized the committees of the House so that his war program could be given the right of way, while he and his friends, John C. Calhoun and Peter B. Porter of New York, «stiffened the backs» of the President's advisers and brought the peaceful and long-suffering Madison to the point of promising hearty support. Between Clay, as leader of the House, and Madison, the candidate of the party for re-election in November 1812, the reluctant Senate was finally compelled to yield, and war was declared in June. The war proved a failure in so far as the annexation of Canada was concerned. Napoleon's great campaign against Russia and England collapsed in 1813 and the situation of the country became critical beyond comparison. To fight Great Britain alone seemed suicidal and Madison looked about for some way of securing an early peace. A commission to treat with England was appointed. Clay was made a member notwithstanding all he had done to bring on the war and he hastened to join John Quincy Adams and the other commissioners at such point as England should designate. After anxious delays and humiliating experiences, the treaty of Ghent was signed. Clay returned to Kentucky in 1815 and was again elected to the House of Representatives of which he became speaker at the opening session. This office he now held with the exception of one term, when he refused an election, till 1825. His influence was undiminished and he did as much as any other, perhaps, to secure the elevation of James Monroe to the presidency in 1816. But when Monroe was inaugurated he appointed Clay's political opponent, if not open enemy, John Quincy Adams, Secretary of State. This was regarded as settling the succession till 1832 and Clay and his friends were deeply offended. He refused a seat in the Cabinet and all his Western friends likewise refused high appointments from the Administration. As speaker of the House, Clay opposed every important measure of the President and offered policies of his own which threatened to break up the solidarity of the Republican party. Andrew Jackson, who had been sent to Florida to quiet disturbances there and who had carried his measures with a high hand, was a special object of Clay's anger. But the long and ominous struggle of the South and the East over the admission of Missouri, 1819-20, drew him into co-operation with Monroe and he became the principal author of and sponsor for the Missouri Compromise (q.v.). The accepted custom of the party since 1801 to allow the Secretary of State to succeed to the presidency was attacked by Clay so bitterly that the different groups fell asunder and each offered its favorite for election in 1824. Clay was the candidate of the West; John Quincy Adams of the East; William H. Crawford of the South. Late in the campaign Jackson entered the race and the West divided its strength. The election showed that neither had won and that Clay, as the fourth on the list of candidates, could not be considered by the House when it came to select the next President. Crawford had been stricken with paralysis and this reduced the contest to two aspirants, Jackson, whom Clay had denounced before the House and the country, and Adams, the most disliked man in the country among Clay's constituents and whom he had denounced since 1817. When Congress met in December, the one anxious query of all was what would Clay do. Few public men have ever been reduced to such a dfficult position, the more difficult since the leaders of the West were almost unanimous in urging him to support and thus elect Jackson. To put Jackson in the President's chair would have been a self-denying act on Clay's part, for the country would not have been willing to take two Western men in succession as presidents. Early in January Clay announced that he would support Adams. This decision alienated his stronger Western supporters, Amos Kendall, Frank P. Blair and Thomas H. Benton. The disappointment of the people of Kentucky was very great. But what weakened Clay's position for the rest of his life was his acceptance of the position of Secretary of State in Adams' Cabinet. Followers of Crawford, like John Randolph, now joined Jackson's friends and set up the cry of «bargain and sale, coalition of Puritan and blackleg,» between Adams and Clay, which led to a duel of comic outcome. As chief of the Cabinet Clay was on the defensive during the four stormy years that followed. The Senate was little more than a national Jackson campaign committee, and even the House weakened in its support of the Secretary of State. When Jackson was at last elected Clay went home to «mend his fences.» Jackson had carried Kentucky in the recent election and nearly all Clay's prominent former friends had deserted him. He desired to be elected to the Senate in 1830 and he began a canvass of all the counties to regain his former popularity. R. M. Johnson, a man of little pretension to high leadership, opposed him. After a long and bitter contest Clay won by a very close vote in the assembly. It was the greatest contest of his life before his own people, for had he been defeated his position as a national leader must have been ruined. Once more in Washington, he began in the winter of 1832 to arrange the program for the presidential campaign ot that year. His American system, formulated in 1823-24, now received its widest advertisement. That is, he would stand for a protective tariff to the point of excluding all serious competition of foreign goods with domestic manufactures, for internal improvements which should absorb whatever revenues there might be, and for a strong national bank, which should have a monopoly of the government's financial business. It was clearly a combination of the East and the few Western States which he might control against the South and the greater West which followed Jackson. He was the logical candidate of the opposition and he made every effort to win. But the election showed that Jackson had carried every State except Massachusetts, Rhode Island, Connecticut, Delaware, Maryland and Kentucky. It was the most decisive election in American history since that of 1804. Yet Clay continued to lead the opposition in Congress and the country against the «Goths and Vandals,» as he called Jackson and his party. A break between Jackson and Calhoun, which had been threatening for a long time, now became inevitable. Nullification by South Carolina of the Federal tariff laws followed. Jackson denounced Calhoun and the nullification movement in December 1832. Civil war was imminent. Fearing the worst, Clay now changed his view entirely as to the tariff, brought in a compromise measure and extended his hand to Calhoun, who joined him in opposition to Jackson. The compromise tariff scheme of Clày became a law in 1833 and nullification was given up in South Carolina. A second time he had patched up a peace between the irreconcilable interests of the country. Clay remained in the Senate during the next decade and he was the master mind of the Whig party, as his followers now came to be called. He planned the campaign of 1836 against Van Buren and he seems to have named the three Whig candidates of that year, the object being to cause the election to be carried to the House as in 1824. Failing in this, he successfully blocked every important measure of Van Buren till June of 1840, when another election was approaching. He was a candidate for the nomination of the Whigs in 1840, but William Henry Harrison defeated him. It was a bitter pill. Clay swallowed it and lent himself loyally to the campaign which followed — the famous log-cabin and hard cider campaign. Harrison won. Clay shaped the new administration and laid plans for the future only to find that death of President Harrison removed from his reach control of affairs. When John Tyler succeeded to the presidency Clay undertook to guide the footsteps of the «inexperienced» man. Tyler refused guidance and Clay denounced him and called upon the Cabinet to resign. The Administration broke to pieces and a new Cabinet was formed. Clay now retired from the Senate with a formal farewell, which reminds one of Jackson's farewell of 1837. But in two years he was again the choice of his party for the presidency. The issue then before the country, the annexation of Texas, had been made by Tyler and on it the Whigs were sorely divided; one-half following the lead of John Quincy Adams, declared that annexation would be to them the dissolution of the Union; the other half, guided by Southerners like Preston and Mangum, were almost as earnestly in favor of annexation. Between these diverging forces Clay made a poor campaign and lost the election to James K. Polk, whom he had ridiculed at the beginning with the query: «Who is Polk?» This third defeat was an ordeal which he did not endure without signs of bitterness. He remarked in a letter that he hoped the country would survive. The Mexican War developed hostile groups in the Democratic party and in 1848 Clay was again a candidate before the Whig convention. Thurlow Weed, architect and master of the great political machine of New York, aided by Alexander Stephens of Georgia and John J. Crittenden of Kentucky, former friends of Clay, secured the nomination of Gen. Zachary Taylor, who was elected. Taylor organized his administration without the aid of Clay. But the problem of the time was once again to determine which of the two hostile sections, the East or the South, should have its way. The territories which had been ceded by Mexico were to be organized, and California was asking admission to the Union as a State. The South demanded that slavery should be allowed in the territories and that California should come in as a slave State or not be admitted at all. How could the inexperienced Taylor solve the problem? More than 70 years of age, and marked with the evidences of many campaigns, Clay offered himself once more to the legislature of Kentucky as a candidate for the Senate. He was elected without difficulty and he appeared in Washington in December 1849. The Southerners, both Whigs and Democrats, were preparing for a Southern convention in Nashville the following June. The object of this gathering was to secede from the Union in event slavery should be excluded from the new territories. The leaders of the East were equally resolute. There was to be no further extension of slavery and they were talking of secession in the event of failure. In January Clay offered himself as a compromiser of the quarrel. Later he prepared his program of concession and sought support from Webster, from his old friends of the South and from moderate newspapers like the Washington *Union*, official organ of the Democratic party. Calhoun opposed him. William H. Seward of New York opposed and the influence of the President was wholly against him. Webster's speech of 7 March gave him a great advantage and later the members of the Nashville convention elected his friends to preside over that body. Still, the South stood firm against him in Washington, and Taylor threatened to send an army into the disputed region. The deadlock lasted till 9 July, when the death of the President put Clay's friend Fillmore into the executive chair. The Cabinet was reorganized in the interest of the compromise and one by one the items of the measure became law during the remainder of the summer. The principal of these were the admission of California as a free State, the enactment of a rigid fugitive slave law and the provision that the new territories south of the line of 36° 30′ might be left to determine for themselves whether they would have slavery or not. It was the greatest triumph of Clay's life, the third treaty of peace between the sections which he had arranged. The country received the news of the passage of the compromise with salutes of a hundred guns in the leading cities and men breathed a sigh of relief when they knew the crisis was passed. Some Southern leaders retired from public life as a protest and extremists in New England declared they would never obey the fugitive slave law. But the great majority North and South were satisfied. Yet the greatest hope of Clay's life had been repeatedly denied him because of that sectional rivalry which he alone had proved able to quiet from time to time. He felt that he had been hardly handled by the country and the people of the country felt during these closing years of his life that they had refused the highest office in their gift to the greatest man of his time and country. His health was already broken; still he remained in the Senate to the last, where he died on the scene of his greatest triumphs as well as of his bitterest defeats.

Bibliography.— Clay, Thomas H., 'Henry Clay' (in 'American Crisis Biographies,' Philadelphia 1910); Colton, Calvin, 'The Life and Times of Henry Clay' (2 vols., New York 1846); Sargent, Epes, 'Life and Public Services of Henry Clay' (New York 1859); Schurz, Carl, 'Henry Clay' (in 'American Statesmen,' Boston 1887). There are still other works on Clay, but no really good and critical biography has thus far been published.

William E. Dodd,
Professor of American History, University of Chicago.

CLAY, any aluminous silicate having plasticity: that is, which can be molded, when moist, into forms which become stone-hard after exposure to a red heat or higher temperature. Plasticity is a physical quality, apparently having little relation to chemical composition, and the exact reason why one clay is more plastic than another is even yet largely a matter of speculation. In a broad way clays may be divided into: (1) Pure clays, mostly silica and alumina, with small amounts of iron, lime, magnesia, soda and potash; (2) sandy clays or loams, comprising much of the arable soil of the world; and (3) limy clays or marls, clays containing a high per cent of lime. Clays are also given a great variety of names, according to special characteristics and economic use. The important divisions, based on use in the arts, are: Kaolin, or China clay, pottery clay, fire clay and brick clay.

Origin of Clay.— The base of all clays is the mineral kaolinite, having the formula $Al_2O_3.2SiO_2+2H_2O$, giving silica 46.3 per cent; alumina, 39.8 per cent; water, 13.9 per cent. It is made up of minute hexagonal plates. It results from the decay of feldspathic rocks, particularly granites and gneisses. Surface waters percolating through such rocks leach out the potash in the feldspar; some silica is also leached out and left in a hydrated state. Kaolinite results from the union of the broken-down alumina of the feldspar with the hydrated silica. Thus were formed in place the kaolin deposits of Cornwall, England, and some of the kaolin of North Carolina and Pennsylvania. (See Geology, section on Work of the Atmosphere). By the erosion of the land the kaolin and other products of rock decay are carried away and deposited as silts in lakes or in the ocean. Also, under the grinding of glaciers, rocks are reduced to a fine rock flour, forming glacial clays (boulder clay or till). The beds of clay laid down in the ocean may be buried deeply under other deposits, and by heat and pressure be changed to shale. When the sea bottom is elevated and the new land surface eroded, the shale may distintegrate into clay again, or the shale itself may be mined by man, ground and used as clay.

Varieties of Clay.— Pure kaolin or China clay is rare. It is pure white and almost free from iron salts. The common chemical impurities in the crude material are silica, iron, lime, alkalis, magnesia and titanium, and the common mineral impurities are quartz, feldspar, mica, calcite, magnetite, limonite and pyrite. If the product is white, contains very little iron and is low in alkalis it passes in the trade as kaolin. Kaolin has little plasticity, and in making pottery other clays are often added to give this quality. It may occur as residual kaolin in the position of the original feldspar body, a vein or dike, or, if transported by streams and deposited at a distance in beds, as sedimentary kaolin. Residual kaolin is apt to be of better quality than sedimentary, containing less iron and other impurities.

The United States imported about 235,438 tons of kaolin in 1912, valued at $1,528,257, the production for 1901 having been 97,253 short tons. Kaolin is mined in De Kalb and Jefferson counties, Ala.; at Hockessin, Del.; in Taylor County, Ga.; at Blandford, Mass.; in Macon, Jackson and Montgomery counties, N. C.; in Chester and Delaware counties, and in the South Mountain region, Pa.; in Aiken County, S. C.; and in Lake County, Fla.; and there are deposits in Missouri, Tennessee, Texas, Arizona, Utah and several other States. In 1910 the United States produced 34,221 short tons of kaolin, valued at $255,873.

Besides being used in making pottery and white tiling and brick, kaolin is largely employed in the manufacture of paper, for weighting the paper and giving a better surface. The largest pottery manufactories in the United States are at Trenton, N. J., and East Liverpool, Ohio. Nearly all the Chester County, Pa., kaolin goes to those places. The South Carolina kaolin is nearly all used in paper-making.

ANALYSIS OF VARIOUS CLAYS

	SiO_2	Al_2O_3	H_2O	Fe_2O_3	CaO	MgO	Na_2O K_2O	TiO_2
1	53.10	33.06	11.32	1.18	0.38	0.08	0.83	——
2	73.80	17.30	4.69	.35	——	1.18	2.49	——
3	59.83	24.58	7.83	1.66	0.28	0.87	3.11	1.17
4	68.13	20.80	6.72	1.20	0.42	0.37	2.55	——
5	67.80	11.55	0.20	6.50	8.90	5.32	2.42	——
6	56.10	27.42	8.90	2.68	——	0.18	2.71	1.0
7	40.22	8.47	20.71	2.83	15.45	7.80	3.20	——
8	57.46	21.15	——	5.52	3.65	1.50	4.72	——

1. Crude kaolin, West's Hill, N. C. 2. Refined kaolin, Mount Holly, Pa. 3. Fire clay, Bolivar, Pa. 4. Pottery clay, Zanesville, Ohio. 5. Paving brick clay, Bloomington, Ill. 6. Front brick clay, Sayreville, N. J. 7. Brick clay, Milwaukee, Wis. 8. Terra-cotta clay, Glens Falls, N. Y.

Fire Clays differ much in color, hardness, texture and composition, and some clays used in making fire brick are not particularly refractory, but are used for their high plasticity. Strictly a fire clay is a nearly pure mixture of sand and clay with only traces of iron, lime and magnesia, and hence makes white or light colored bricks which can stand very high temperatures. According to Ries a clay should not be considered refractory unless its fusing point is above 2,700° F. Fire clays are divided into plastic and flint, the former, if hard when dug, becoming plastic when ground and mixed with water; the latter, though sometimes having nearly the same composition, do not become plastic when similarly treated. Fire clays, like kaolins, are sometimes residual products of the decay of feldspar veins, but most are of sedimentary origin. Some form the underclay of coal seams, but all such underclays are not refractory. The underclays of the Michigan coal beds are not. Fire clays in the United States are found in rocks of many geological periods, but chiefly in the Carboniferous and Cretaceous. Workable deposits are known in 18 States; important deposits being in western Pennsylvania; in the coal-mining region of Ohio; in a belt across New Jersey from Perth Amboy to Trenton; in Cecil, Garrett and Allegany counties, Md.; near Saint Louis, Mo.; near Woodstock and Anniston, Ala., and near Golden, Colo.

Potters' Clay.— Clays for potters' use, apart from the materials used in accessory work, such as fire-brick, saggers, etc., are divided into two classes, kaolins and ball clays. The former term is derived from the Chinese Kao-ling, meaning lofty hill. The Chinese porcelain clay was found in quantities in a hill thus named, and the term applied to the clay served to define it. The word kaolin is now applied by common consent to a residual clay which remains white after burning. A residual clay is one which lies as it was formed. Masses of feldspar have been decomposed, the contained potash has been gradually dissolved by carbonated waters, and the residue of silica and alumina has been left. There are usually more or less undecomposed feldspar and grains of quartz associated with the clay, and hence most kaolins are washed before being put on the market.

Kaolin is well known as forming one of the ingredients in Oriental porcelain, the other ingredient being a quartzose feldspathic rock called in China *petuntse*. For Sèvres porcelain kaolin is obtained from Limoges.

Ball clay,— probably corrupted from bowl clay,— is a sedimentary clay, having been washed up and redeposited. It is valued for a high plasticity which kaolin does not possess. The purest ball clay is found in Florida and is sold under the name of «plastic kaolin.» Most of these clays burn to a cream or almost a stone color. They are mined in New Jersey, Kentucky, Missouri, Colorado and other States, in addition to the Florida clay already mentioned. Ball clays are not usually washed before use.

Brick Clays are mixtures of sand and pure clay with lime, magnesia, iron, potash and soda; in fact, bricks are often made from sandy mixtures which are not properly clay. A mixture with considerable iron burns red, from the oxidation of the iron. Carbonate of lime, or magnesia, by forming light-colored silicates, counteracts this red color. Thus the red clays of Wisconsin, which sometimes contain 20 per cent of lime, make the cream-colored Milwaukee brick. The sedimentary glacial clays are largely used for brick-making in the Northern States, while sedimentary surface clays and loams are employed in the Western States and residual clays in the Southern States of this country. All that is required is that the brick shall be of good color, dense, hard and of regular form. Brick material of good quality is found in nearly every State of the Union.

For making paving-brick a clay or shale should be relatively high in lime, iron and the alkalis, that it may vitrify well in burning. When ground and mixed the clay or shale should be fine-grained and plastic, and should shrink but little when burned. Of the Western States Illinois leads in the production of paving-brick, with Missouri second.

The very plastic clay known as gumbo in the Southern States, besides other clays, is burnt in small lumps and used as ballast by a number of railroads.

Terra cotta, used in fire-proof construction and for decoration, may be made of any clay that will make good, strong brick and contains no excess of soluble salts that will «whitewash» on weathering.

Methods of Mining.— The clay, if it lies at or near the surface, is first stripped of soil or sand and gravel; sometimes as much as 30 feet being removed. In New Jersey the clay is often dug in pits as deep as the thickness of the bed. Usually clay beds are worked either by digging the clay entirely from the base of the bank, by working the bank on an incline of about 30 degrees or, where the bank is over 30 feet high, by working in benches six to eight feet wide and seven to nine feet high. Steam shovels are sometimes used. Where the clay is tough it is often worked by undermining several feet and then breaking a foot or more from the face by wedges. Blasting is used in very tough clay and in shale. If the clay lies at some depth, drifts large enough for a man and a wheelbarrow are driven into the bank side by side. Sometimes a shaft is sunk and drifts driven from the base, this method being used in Pennsylvania and Ohio and in the fire-clay beds of Missouri.

Egyptianized Clay.— A discovery which gives good promise of affecting the clay industry and its various branches has been made by Mr. E. G. Acheson of Niagara Falls. While experimenting in crucible manufacture, Mr. Acheson had occasion to search for a clay possessing certain qualities. After a series of experiments the account of Egyptian brick-making given in the fifth chapter of Exodus attracted his attention, and conceiving the idea that some property in the straw used in brick-making in Egypt might give him the result he sought, he boiled a quantity of straw, obtaining a dark-red liquid which he used in the treatment of clay, finding it excellent for increasing its plasticity. He sought out the principle, and determined that the agent was tannin. He treated other clays with water in which tannin was in solution, and realized that he had made an important discovery.

The name given by Mr. Acheson to clay treated by his process is «Egyptianized clay.» He has discovered that it is practicable so to treat clay and other earthy materials as to ensure greater strength in the products made therefrom, also to greatly reduce the shrinkage and warping in the process of drying and baking and to increase the solubility and the plasticity of the material. By his process, non-plastic clays may be rendered plastic and plastic clays made more plastic by treatment with tannin or an agent having the astringent principles of tannin.

It has been found by experts of the highest standing that clay so treated is changed in a remarkable manner. Even one-half of 1 per cent of tannin develops a wonderful effect, requiring 13 per cent less water to make the clay soft. The maximum effect of the process and treatment, however, seems to be obtained by the use of 2 per cent of tannin in a 10-day treatment, consisting in keeping the clay wet, so that the tannin is dissolved. In the burned form the strength of the clay is increased 50 per cent, while in the sun-dried form it is increased in tensile strength 350 per cent. It is also observed that the Acheson treatment removes the crackling tendencies of many clays. In cases where clay articles are to be made of a certain size, they can be made more exact by the Acheson process, as there is less shrinkage. All parts intended to carry loads may be greatly increased in strength, while there is decreased porosity. Many of the plastic clays are off color, but non-plastic clays of desired color will be brought into service by the Acheson process. In making glass pots it now takes months to «age» or temper the clay, while with the Acheson process the maximum effect is obtained in a 10-day treatment. It is told of the Chinese that the people of one generation prepare the clay for the use of the next, all of which time is spent in making the clay plastic. Under the Acheson process the results are said to be more pronounced in 10 days than those obtained by old methods in years.

The total value of the clay products made in the United States in 1909 was $168,895,365. The output of the leading States was as follows:

STATE	Brick and tile	Pottery	Total
Ohio	$9,358,000	$21,173,272	$30,531,272
Pennsylvania	9,225,000	8,962,738	18,187,732
New Jersey	4,073,000	9,587,832	13,660,832
Illinois	9,765,000	3,488,282	13,253,282
New York	8,433,000	3,403,496	11,836,496
Missouri	3,676,000	4,068,701	7,744,701
Indiana	4,719,000	2,965,768	7,684,678
Iowa	4,483,000	464,265	4,947,625

Bibliography.— Barber, ‘Pottery and Porcelain of the United States’ (New York 1901); Binns, ‘The Potter's Craft’ (ib. 1910); Bourry, ‘Treatise on Ceramic Industries’ (ib. 1911); Merrill, ‘Rocks, Rock Weathering, and Soils’ (ib. 1906); Prime, ‘Pottery and Porcelain of all Times and Nations’ (ib. 1878); Ries, ‘Clays, Occurrence, Properties and Uses’ (ib. 1908); Ries and Leighton, ‘History of Clay-Working Industry in the United States’ (ib. 1909); Rohland, ‘Die Tone’ (Leipzig 1909); Searles, ‘Modern Brickmaking’ (New York 1911); and the various reports of the State geological surveys. See CLAY-WORKING MACHINERY.

CLAY CENTRE, Kan., the county-seat of Clay County, is situated on the Union Pacific and Chicago, Rock Island and Pacific railroads, and on the Republican River, which supplies ample water power and which is utilized by the electric light and power plants, both of which are owned by the municipality. The principal industries are flour mills, cigar, steel-tank, broom and cement-block factories and brickworks. There are two large greenhouses, which make extensive shipments to all parts of the State. Pop. 3,438.

CLAY IRON-STONE, oxide of iron (hematite) mixed with clay or sand, an iron ore of importance in England. It is hard and red to brownish-black in color. The name is also given to the argillaceous carbonate of iron occurring in nodules and beds in the coal regions of Pennsylvania, Ohio and other States. When intimately mixed with coal, as in Scotland («black-band iron-stone»), it is of importance as an iron ore.

CLAY MARL. See MARL; SOIL.

CLAY PRODUCTS. See MINERAL PRODUCTION OF THE UNITED STATES.

CLAY-WORKING MACHINERY, machines designed for the proper preparation of clay which is subsequently used in the manufacture of bricks, tiles, pipes, etc., in the production of which the importance of the proper preparation of the clay can scarcely be overestimated. A great many of the subsequent difficulties, imperfections and the amount of waste product in the manufacture of articles from clay may be traced directly to the absence of proper treatment of the clay prior to its use in the molding machines. Among the principal machines of this class are the bevel-geared clay granulator and feeder, designed to work on a horizontal plane and reduce plastic, lumpy clay into a mass of uniform texture, before it is fed into the crushing machines. It consists of a tub the sides of which may be made either flared or vertical, within which is rotated a main shaft of large diameter, carrying forged-steel knives. These machines are frequently used to feed into disintegrators, or some form of crushing rolls used for fine grinding, affording the advantage of having such crushers fed uniformly instead of being alternately overloaded or empty. The double shaft clay feeder and mixer (Figs. 1 and 2) is designed for preparing and feeding plastic clay. As a feeder it forms the bottom of a clay storage bin and will discharge the material at a uniform rate determined by the speed at which the pulley is driven, by the pitch at which the knives are set and by the position of the adjustable gate which

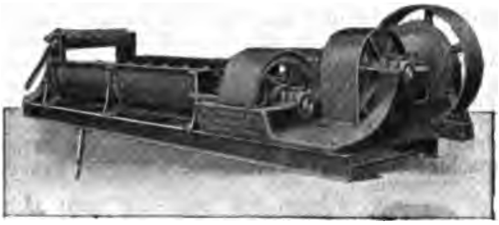


FIG. 1.— Bevel-Geared Clay Granulator and Feeder

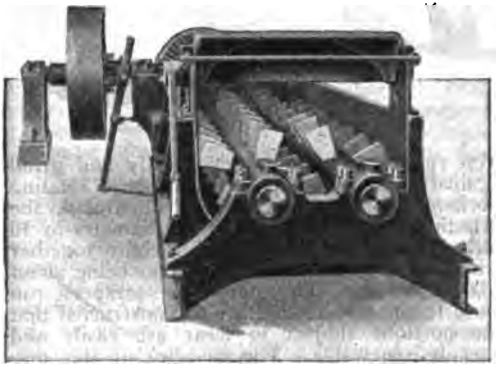


FIG. 2.— Detail of Clay Granulator

regulates the final control. It may also be used to advantage as a double shaft pug mill, in which case the clay bin and the gate are omitted. The standard machine is bevel geared with the driving pulley on the right-hand side as shown in the illustration. Driving pulley may be placed on the left-hand side if desired. The machine may also be built spur geared. The standard machine discharges the material at the end of the mixing chamber opposite the driving gears, but the machine may be built so as to discharge the material between the mixing chamber and the gear frame.

The mixing and pugging machine is designed to mix two or more ingredients, or dry and wet materials, and to deliver a thoroughly mixed, well-pugged mass, in uniform quantity. It is especially valuable as a mixer of "grog" or ground calcined material with plastic clay, ground shale with tough clays, and other finely ground or granular material with plastic binders.

Fig. 3 shows an all-iron and steel dry pan, which is probably the most useful machine for grinding shale, such as is generally used in the manufacture of street paving bricks, and in fact all of the ordinary brick clays when dried sufficiently to pass through a screen. The machine consists essentially of a pair of heavy iron rollers which rotate vertically and grind against an iron disc of sectional plates rotating horizontally. In the machine illustrated, the grinding rollers are 48 inches in diameter by 10 inches face, their combined weight together with that of their shafts and boxes being about 13,000 pounds. The plows or scrapers run close to the screens and are so constructed that the portions subject to wear are easily and cheaply renewable. The capacity of this machine depends entirely upon the nature of the material ground and the amount of moisture contained in that material and the size and pattern of the screen openings. The total weight of the machine is about 30,000 pounds, and it is fitted with a friction-clutch pulley 48 x 12 inches.

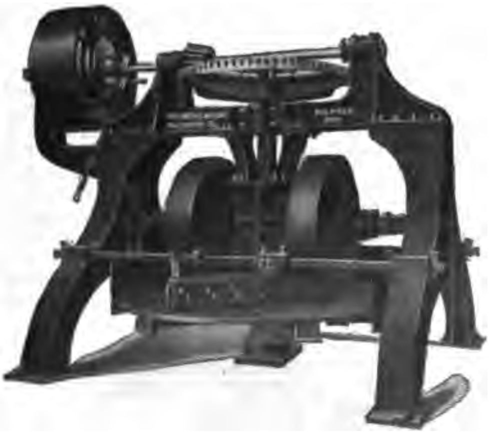


FIG. 3.— Nine-Foot Dry Pan Machine

A type of wet pan especially valuable as a mixing and clay preparing machine is shown in Fig. 4. It is a thorough pugger and mixer for all kinds of clay. The mullers or grinding rollers have hard chilled faces, are 48 inches in diameter, with 7-inch faces. This machine is now generally supplied with a mechanical unloader for emptying the batch mechanically. Fig. 5 shows a form of the clay disintegrators employed to work plastic clays in which stone and gravel are embedded. It consists of two rollers, one of which is driven at a high rate of speed (700 revolutions per minute) while the other is run at a rate varying from 50 to 100 revolutions per minute and acts merely as a feed roll. The fast running roll is equipped with steel bars which project slightly beyond its face and act with a cutting action against lumps of strong, tough clays, and also throw out the larger stones against which they come in contact, while the pebbles are crushed and ground up with the clay. It has a broad, heavy iron bedplate. The parting strain between the two cylinders is borne by two heavy through-bolts which pass from one journal box to the other and also enable the regulation of the space between the rolls, varying the capacity of the machine and the degree of fineness of the ground material. Compound clay crushing rolls are made in a great variety of patterns. The machine illustrated in Fig. 6 combines the features of a disintegrator and a smooth roll crusher and is especially useful for the working of clays that require an extra amount of preparation. The upper section is made of two rolls running at variable speed. Similar to that of the disintegrator, the small or high speed roll has projecting blades of hardened steel. The large roll operates at a slower speed. The effect of the combined motions of these rolls is to shred or separate the material and prepare it for the further action of the lower section, which is composed of two large chilled-face rolls for finer grinding. The lower rolls may be adjusted close to each other and thus act as fine grinders of the material partially pre-

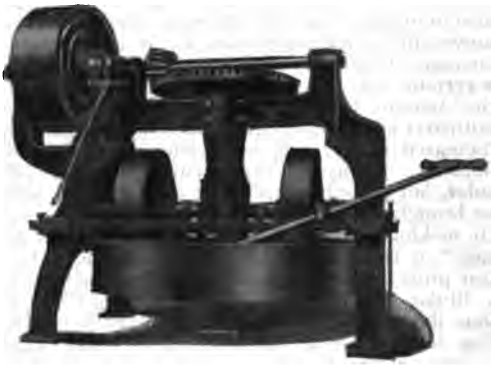


FIG. 4.— Nine-Foot Wet Pan Machine

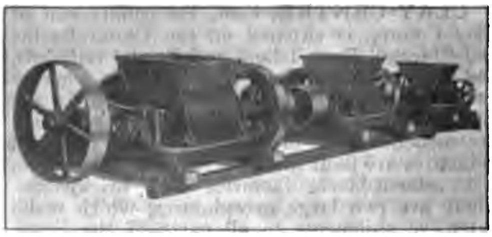


FIG. 5.— Clay Disintegrator

pared by the upper set. The hollow-ware machine shown in Fig. 7 is particularly adapted for the manufacture of all kinds of hollow ware, such as fireproof partitions, and a great variety of other shapes from plastic material. There has been continuous progress in hollow-ware machines, due to increased use of hollow brick for partition walls. Sewer-pipe manufacture in the United States increased about 60 per cent in the period between 1904 and 1916, and there was a corresponding increase in the making of drain tile machines. Flower pot machinery has also come into considerable use. A variety of drying systems have been developed for hastening the drying of the clay in manufacture. One of these is the rotary clay dryer, having a long cylinder of large diameter, heated by a furnace. Clay feeders are made to supply material properly mixed to hollow-ware machines and the like. The clay plow and gatherer is a machine for taking clay from the surface of a field. There are several types of cutting machines on the market for separating the clay into bricks or paving blocks. A reciprocating automatic cutter is made, principally for severing paving blocks, and is adapted to repressed blocks or wire cut lug pavers. The rotary automatic cutter is largely employed for brick work. The poindometer is a machine for measuring materials at the same time that it automatically tempers the clay. All material is weighed, measured and delivered in predetermined quantity in an even, constant flow. Since about 1905 there has been great improvement in methods of transportation about clay properties. Steam, electric and gasoline locomotives are employed to handle light tram-cars. A great variety of dryer cars are built, with single, double and triple decks. An increasing number are made with steel decks, upper decks being often made to fold or slide away. Other machinery used in clay working, such as conveyors, steam shovels, kilns, pyrometers, etc., will be found described under those titles.

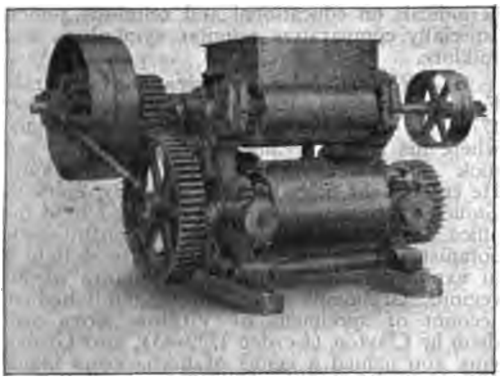


FIG. 6.— Four-Roll Compound Clay Crusher

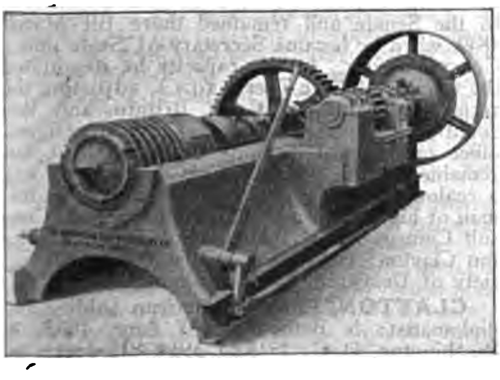


FIG. 7.— Hollow-ware Auger Machine, showing arrangement of Liners and Augers

C. B. SHARER,
The American Clay Machinery Company.

CLAYBERG, John Bertrand, American lawyer: b. Cuba, Ill., 8 Oct. 1853. Received his early education in the schools of Cuba and later entered the law department of the University of Michigan, from which he was graduated in 1875. He was admitted to the bar in 1875 and was employed by Judge Thomas M. Cooley in his works of 'Taxation' and 'Torts.' He moved to Montana in 1884 and in 1889 was appointed attorney-general of the then Territory of Montana. From 1891 to 1913 he was non-resident lecturer on mining law in the University of Michigan and during many years of that time was also non-resident lecturer on the law of irrigation. He has been an extensive contributor to the law journals of the United States. In March 1903 he was appointed chief of the Supreme Court Commission of the State of Montana and continued to perform the duties of that office until the work of the Supreme Court was brought to date, and resigned 1 April 1905. In 1911 he organized the law department of the University of Montana and is the consulting dean of that department and a non-resident lecturer on mining law. He moved to San Francisco in 1912, at which place he has continued practice as a lawyer.

CLAYBORNE, William. See CLAIBORNE, WILLIAM.

CLAYDEN, Peter William, English Unitarian clergyman and author: b. Wallingford, England, 20 Oct. 1827; d. London, 19 Feb. 1902. After being pastor of Unitarian congregations at Boston, Lincolnshire, 1855–59; Rochdale 1860; and Nottingham 1860–68, he became one of the staff of the London *Daily News,* on which he remained till 1896, in the meantime establishing the Reading *Observer* in 1873, remaining its proprietor for six years. He was president of the Institute of Journalists (1893–94). He published 'The Religious Value of the Doctrine of Continuity' (1866); 'Scientific Men and Religious Teachers' (1874).; 'England Under Beaconsfield' (1880); 'Samuel Sharpe, Egyptologist' (1883); 'The Early Life of Samuel Rogers' (1887).; 'Rogers and His Contemporaries' (1889); 'England Under the Coalition' (1892).

CLAYMORE, formerly the large two-handed, double-edged sword of the Scotch Highlanders; now the name is given to a basket-hilted, double-edged broadsword, closely resembling the cuirassier's broadsword of the 17th century in England.

CLAYPOLE, Edward Waller, American geologist: b. Herefordshire, England, 1 June 1835; d. Long Beach, Cal., 17 Aug. 1901. He was graduated at the University of London in 1862; was professor of geology and biology in the Antioch College, Yellow Springs, Ohio, of Butchel College, Akron, Ohio., and for a time was on the geological survey of Pennsylvania. He was the author of numerous reports on the geology of Perry County, Pa., and of papers and essays on geological and biological subjects. He was a member of a number of geological societies in London, Edinburgh and America, and of the American Association for the Advancement of Sciences.

CLAYPOLE, Noah, the sneaking, cowardly apprentice in Dickens' 'Oliver Twist,' who robs his master's till, joins Fagin in London and by turning state's evidence insures the conviction of Bill Sykes for the murder of Nancy.

CLAYS, klās, **Paul Jean,** Belgian artist: b. Bruges 1819; d. 1900. He studied under Vernet and Gudin at Paris. At first he failed of success, but later by adopting a broader style he attained a large measure of success. His favorite subjects were the waters of the Netherlands. His drawing is inferior but his coloring is delicate and his work has splendid charm. His best known works are 'Bay of Ostend' (Brussels); 'Shipwreck on the Shetland Islands' (Brussels); two marine views in the National Gallery, London; 'Open Sea' (Munich); and 'Celebration of the Freedom of the Port of Antwerp,' in the Metropolitan Museum, New York.

CLAYTON, Augustine Smith, American lawyer: b. Fredericksburg, Va., 27 Nov. 1783; d. Athens, Ga., 21 June 1839. He was graduated at the University of Georgia 1804; was admitted to the bar and practised with eminent success. He served in the State legislature; was judge of the Superior Court 1819–25 and 1828–31; and a representative in Congress from 1831 to 1835. He was removed from the Supreme Court for differing with the legislature on one point of the controversy concerning the occupation of the territory of the Cherokee Nation by the State of Georgia. In Congress he opposed the tariff and United States bank measures. He is said to be the author of the political pamphlet 'Crockett's Life of Van Buren.' He compiled 'The Laws of Georgia, 1800–10' (1812).

CLAYTON, Henry DeLamar, American jurist: b. Barbour County, Ala., 10 Feb. 1857. He was graduated at the University of Alabama in 1877. He was admitted to the bar in 1878 and from 1880 to 1914 practised at Eufaula, Ala. He was register in chancery of Barbour County 1880–84 and member of the Alabama general assembly in 1890–91. In 1893–96 he was Federal district attorney for the middle district of Alabama. He was a member of Congress from 1897 to 1913, and after 1888 was a member of the Democratic National Committee and was chosen permanent chairman of the Democratic National Convention at Denver in 1908. Since 1914 he has been United States district judge for the middle and northern districts of Alabama.

CLAYTON, James Benjamin, American clergyman: b. Washington, D. C., 9 Feb. 1867. He was educated at Columbian (now George Washington) University and at the Southern Baptist Theological Seminary. He spent several years in evangelistic work and held pastorates at Norfolk and Falls Church, Va., 1890–91; Hannibal, Mo., 1897–98; Hynesboro Park, Md., 1898–99; and Washington, D. C., 1910. In 1903–09 he was chief clerk of the bureau of American ethnology, and since 1911 has been dean of the theological department of Potomac University. He is an extensive contributor to periodicals on educational and religious topics, especially comparative religion, symbolism and folklore.

CLAYTON, John, American botanist: b. Fulham, England, 1686; d. Virginia, 15 Dec. 1773. In 1705 his family came to Virginia, where his father became attorney-general, and took up his residence near Williamsburg. He entered the office of Peter Beverly, clerk of Gloucester County, succeeded him and held the office for 51 years. He was an enthusiastic botanist and throughout his long life delighted in exploring and describing the plants of his region. Gronovius and Linnæus published an account of specimens of Virginia flora sent them by Clayton (Leyden 1739–43), and Gronovius' son named a genus of herbaceous plants *Claytonia* in his honor. Clayton's studies of Virginia natural history were published in the *Philosophical Transactions* of the London Royal Society, and his descriptions of some new species of plants are to be found in the third volume of Peter Force's 'Tracts.' Two folio volumes of manuscript, almost ready for the press, were burned with the records of New Kent County during the Revolutionary War. See CLAYTONIA.

CLAYTON, John Middleton, American statesman: b. Dagsboro, Del., 24 July 1796; d. Dover, Del., 9 Nov. 1856. He was graduated at Yale in 1815, admitted to the bar in 1818, and became a leading lawyer in the State. He was elected United States senator in 1829 and held office till the close of 1836, when he resigned. He was then appointed chief justice of his native State and continued on the bench for nearly three years. In 1845 he was again sent to the Senate and remained there till March 1849, when he became Secretary of State under General Taylor. In this capacity he negotiated the Clayton-Bulwer Treaty (q.v.), adjusting the respective claims of Great Britain and this country in Central America. Clayton resigned office on General Taylor's death in 1850, but remained in the Senate till his death. He was a zealous Whig, an able debater and a statesman of high talent and upright character. Consult Comegys, J. P., 'Memoir of John Middleton Clayton' (in *Papers* of the Historical Society of Delaware, No. 4, Wilmington 1882).

CLAYTON, Powell, American soldier and diplomatist: b. Bethel, Pa., 7 Aug. 1833; d. Washington, D. C., 25 Aug. 1914. He received an academic education in Bristol, Pa.; later studied civil engineering and went to Leavenworth, Kan., as engineer and surveyor in 1859. When the Civil War broke out he entered the Union army as captain of the 1st Kansas Infantry. In May 1863 he led a successful expedition against a band of guerrillas on the White River, Ark., and also to destroy Confederate stores; and in 1864 was promoted brigadier-general of volunteers. At the close of the war he settled in Arkansas; was elected governor in 1868; United States senator in 1871–77; appointed Minister to Mexico in 1897 and raised to rank of Ambassador in 1899.

CLAYTON, N. Y., town in Jefferson County, on the Saint Lawrence River, forming the gateway to the Thousand Islands. It is on the New York Central Railroad and is connected with Watertown by bus service. The principal industry is shipbuilding. There are two banks, a parochial school and a high school; also a town-hall. It is governed by a president and board of trustees which it elects yearly. As a summer resort it is very popular. Pop. about 3,000.

CLAYTON ACT, a so-called anti-trust act, passed by Congress 15 Oct. 1914, prohibiting corporations to create monopolies by indirect dealing, such as offering their products at special low prices until their competitors are driven out of business. The act forbade any forms of contract by which the purchaser of an article agreed not to buy the same kind of article or accessory articles from a competitor of the seller. Other clauses of the act forbade holding corporations and interlocking directorates. To the trade commission and also to the interstate commerce commission was given power to end these discriminations and other violations of the strong clauses against monopoly. One clause declared that the provisions of the act should not apply to fraternal, labor or agricultural associations, not conducted for profit.

CLAYTON-BULWER TREATY, a treaty existing from 1850 to 1901 between the United States and Great Britain. It was an agreement designed to prevent either country from securing exclusive rights over any interoceanic canal across Nicaragua. (See PANAMA CANAL). Its origin represented a supposed mutual withdrawal from positions rapidly generating war. Its lifetime has two opposite phases: (1) That in which the United States, wishing no such exclusive rights, held it and appealed to it as a bulwark against British encroachments, opposing only an injurious interpretation of it; (2) that in which the same power did wish such privileges, endeavored first to gain British assent to its abrogation, and after long and fruitless struggles and repeated threats of abrogating it without such assent, was only withheld from the abrogation by a compromise treaty which replaced the old. The three periods were as follows:

1. The English colony at Belize (now British Honduras), for a century or more had strengthened their position against the Spaniards by a vague protectorate over the Mosquito Indians, occupying the northeast coast of Nicaragua. They termed their chiefs «kings,» and upheld their dominion over «Mosquitia,» usually called the Mosquito Coast. In 1815 they crowned one of them at Belize and, when the Spaniards lost control of Central America in 1822, had him set up a claim to boundaries reaching down into Costa Rica, and so including the banks of the San Juan River, where the canal would run if built. In 1841 this sovereignty was enforced by raiding San Juan del Norte at the mouth of the river, and carrying off the commandant; in 1847 the «king» announced to Nicaragua that on the first of January next he should «reassume his lawful control» over the San Juan, and early in the year the English seized the town and renamed it Greytown. A new English treaty was then made with Nicaragua, recognizing this occupation. This roused great excitement in the United States, as equally a blow at the Monroe Doctrine and against American control of the canal; and an over-zealous Nicaragua chargé of the fire-eating Polk administration drafted a treaty for United States fortification of the canal, and a guarantee of Nicaragua's sovereignty over all the territory she claimed. This, if we made its provisions active, meant war with England. The pacific Taylor administration then in power framed a milder treaty for a right of way merely, allowing Nicaragua to make similar ones with other nations. This still left Greytown as an apple of discord, and conflicted with the English treaty. Both England and America were on edge with suspicion: the former (whom events justified) that American expansion would end in a claim to entire control of the canal, which would prejudice British colonial interests; the United States, that the English recognition of a fictitious and swollen sovereignty by a tribe of savages over the Atlantic end of the canal foreshadowed the total exclusion of the United States. Each party in fact wanted only to bar the other's monopoly. John M. Clayton (q.v.), Secretary of State, opened negotiations with the English Minister, Sir Henry Bulwer, in January 1850, for a joint control. Meantime Great Britain, to secure the Pacific end, sent an expedition to occupy an island in the Gulf of Fonseca (then supposed to be the natural western terminal); our then Nicaraguan representative, E. G. Squier (q.v.), obtained a temporary cession to us of Tigre Island, the nearest one to Nicaragua, to block this scheme, pending a formal treaty; shortly afterward the British expedition arrived, and seized Tigre «for debt.» Clayton, in great fear lest the popular indignation should force his hand, pushed the treaty through without sufficient insistence on clear definition of the points at issue. It was signed 19 April, and passed the Senate, 42 to 11. Its provisions were that (1) neither power was to have exclusive control over the proposed canal; (2) neither was to fortify the canal or its vicinity; (3) neither was to occupy, fortify, colonize or have dominion over any part of Central America, either directly or through any «alliance or protection, intimacy, connection, or influence» in or over it; (4) the two powers should mutually guard the safety and neutrality of the canal, and invite all other nations to do the same; (5) they should aid and protect any authorized and reasonably operated canal company; (6) the fifth article (to establish a general principle) should extend also to any other means of isthmian transit.

England did not formally withdraw her Mosquito protectorate, but with the neutralization of the canal it ceased to have any object, and was thought sure to drop. Before the ratifications were exchanged, however, Lord Palmerston wrote to Bulwer that the British government would interpret the treaty as not applying to Honduras «or its dependencies.» This could include Mosquitia, and it was Clayton's duty to settle that point before proceeding; but in fear of having his statesmanlike plan wrecked, and confident of no practical evil resulting, he assumed that it referred only to the islands, did not press Bulwer for assent to this construction, concealed the three quoted words from the Senate and the attorney-general and the ratifications were exchanged 4 July. Great Britain had won a distinct diplomatic victory; she had secured a pledge from the United States not to occupy any position in Central America, while herself retaining the entire eastern coast of Nicaragua.

2. The ambiguous interpretation of the treaty satisfying neither power, Daniel Webster (q.v.), who succeeded Clayton in 1850, undertook negotiations with Bulwer to modify it; but what each side most desired was what the other would not grant — recognition or abandonment of the bogus Mosquito claim to the mouth of the river. In 1851, to clear up the meaning of the word «dependency,» Great Britain occupied Greytown; proclaimed afresh the Mosquito protectorate; and in November one of her men-of-war fired on the American vessel *Prometheus* for refusing to pay port dues at Greytown. England disavowed this, but the question which Clayton had shirked must be settled. About this time the English had started a project to build a ship railroad across Honduras; and to hold the approaches, their government reoccupied (August 1852) a group of islands off the northern coast, called the Bay Islands, formerly part of Belize. American suspicion once more became hot; and the new Pierce Senate in December ordered an investigation into the way the treaty had been kept, called for the papers and for the first time found how they had been tricked — not, however, by the English diplomat, but their own. In great wrath, they denounced the occupation of the islands and the Mosquito protectorate as an infraction at once of the treaty and the Monroe Dóctrine, and Marcy, now Secretary of State, instructed Buchanan, Minister to England, to insist on the British evacuation of all English territory in Central America except Belize. Lord Clarendon replied that Belize was not a part of Central America as understood by the treaty; that the Bay Islands were a part of Belize; that the treaty did not refer to Mosquitia, but only prohibited further colonization; and that the Monroe Doctrine was no part of international law. Just then a quarrel between the Mosquito Indians and the American settlement south of Greytown led to a United States gunboat bombarding and burning the latter. Then William Walker (q.v.), with the aid of a Nicaraguan faction, became for a time the master of the state, ostensibly in the interest of the United States, whose slaveholding government at last received a representative from his; and the British believed that this country intended to retain possession of Nicaragua. On the other hand, Costa Rican action against Nicaragua was laid to English incitement. Walker continued to make mischief till shot in 1860. Dallas, who succeeded Buchanan, drew up with Clarendon a treaty of 7 Oct. 1856, which came to grief on the question of the Bay Islands. In 1857 Buchanan became President, and supported his Secretary of State, Lewis Cass, in making a preferential canal treaty with Nicaragua: to which Great Britain objected as violating the Clayton-Bulwer Treaty, and it was not ratified. In the fall of that year, Buchanan announced his intention of proposing an entire abrogation of the treaty and arranging a new one on a satisfactory basis. Lord Napier, now British Minister, proposed three alternatives: a mutual abandonment of the treaty and return to the *status quo ante;* submission of the question to arbitration; and the awaiting the issue of treaties pending between Great Britain and the Central American states. The last was accepted, and the results were satisfactory enough to prevent further trouble for more than 20 years. The Bay Islands were retroceded to Honduras on condition of not parting with them to any other nation; the Mosquito protectorate was abandoned, and a reservation set up for the Indians by Nicaragua, which was to pay them $5,000 a year or else the rights reverted to Great Britain; and Greytown became a free port under Nicaraguan sovereignty. The conditional clauses of the renunciation were not pleasing to the United States, and in fact the money was never paid, partly because Nicaragua expected the United States to back its refusal; but on the whole the settlement was accepted as a happy ending to the wrangle. Up to 1880, though the growing sentiment in favor of exclusive United States control of the canal sometimes fretted against the treaty, a host of treaties and other international actions were based upon its validity, and it was more than once appealed to when British acts (as the erection of Belize into the colony of «British Honduras» in 1862) were assumed to violate it.

3. The latent feeling in favor of exclusive control was stirred into active life by the French canal at Panama, and the fear that it would give that nation the military control of Central America. In March 1880 President Hayes sent a special message to Congress enunciating the policy of «an American canal under American control,» expanded later into the claim that the banks of the Nicaragua Canal would be a continuation of the United States shoreline. As a result, Congress passed several resolutions recommending the abrogation of the Clayton-Bulwer Treaty. Garfield in his inaugural of 4 March 1881 spoke (though less strongly) in the same strain; the project of a joint European neutralization of the Panama Canal was arousing much American feeling. J. G. Blaine (q.v.), then Secretary of State, opened the attempt at an outright repudiation of the treaty. In a circular to the European powers, 24 June 1881, he declared that the United States would in future allow no foreign interference in the control of any isthmian canal, whose neutrality we would ourselves guarantee; and that any European action toward sharing in such guaranty would be held equivalent to an alliance against the United States. Lord Granville, for Great Britain, replied briefly that this matter was already settled by the Clayton-Bulwer Treaty, and his government relied on its observance. Meantime and afterward, 19 and 29 Nov. 1881, Secretary Blaine sent two long arguments of his position to James Russell Lowell, then Minister to England. He did not, however, allege that the treaty was null, or commit the country to an open repudiation of it, but complained of it as so contradictory of interpretation, and mutually vexatious, that it ought to be no longer binding under new circumstances. He also asserted that the joint control would be virtually exercised by England, from her superior naval strength. In fact, however, the treaty provided

not for a joint control, but a joint refraining from control, and prevention of any other power gaining control. Lord Granville replied by two dispatches of 7 and 14 Jan. 1882, traversing the logical and historical arguments adduced. Garfield's murder led shortly to Blaine's retirement, and F. T. Frelinghuysen's accession to his place. The outcome of further correspondence was, that England would not give up the treaty, and declared that the United States was stopped by its own acts from interfering with it, and that the Monroe Doctrine was a mere assertion of force, having no standing in international law, and had the same place in diplomatic argument as a list of the military or naval forces. Congress and the President (Arthur) were much dissatisfied with this result; and the latter proceeded to draw up a treaty with Nicaragua in flat defiance of the Clayton-Bulwer Treaty. It formed a perpetual alliance between the United States and Nicaragua, whose territorial integrity this country guaranteed; save that the United States was to build a canal and have exclusive control over it, and own in fee simple a strip on each side. The Senate shrunk from this direct repudiation, without stronger cause than yet existed, and refused, 32 to 23, to ratify the new treaty. Mr. Cleveland's accession put a stop to the agitation for many years, as he disapproved of the new movement, preferring a union of the nations in a common protection of what was for their common interest. So far from any attempt being made under his administrations to repudiate the treaty, on two important occasions it was appealed to in protest against acts of Great Britain. The first revival of the feeling of 1880-84 in practical form was in President McKinley's second annual message, December 1898, favoring a canal under American control; and few then doubted that it must be through Nicaragua. The acquisition of new territory and the increase of the navy led many who had been opposed to the movement to change their minds, and favor a canal through which the United States at all times could pass its war vessels, and from which it could exclude its enemies. Others continued to argue that if the country were not superior in naval force it could not maintain that privilege against its enemies, and if it were, could enforce it against them in any event, and that an exclusive control only made the canal the instant mark of our enemies. But the dominant feeling was strongly against the treaty; congressional resolutions declared it void; the press denounced it; and the sentiment was in favor of President Arthur's old scheme of acquiring a strip of land along the canal outright. The British feeling was by no means strong for the treaty, but it preferred a modification by decent diplomatic forms rather than a violent abrogation. To take the movement out of the hands of newspapers and demagogues, the American and British governments hastened to devise a new arrangement which should not throw all old principles to the winds, and a treaty was negotiated by Secretary John Hay on our side and Sir Julian Pauncefote on the other, known as the first Hay-Pauncefote Treaty, signed 5 Feb. 1900, and sent to the Senate. The majority were astonished and indignant, as the new treaty not only did not abolish the old, but proclaimed it in force and binding; adhered to its principles of neutralizing the canal, which were what the growing sentiment wished to reverse; and was in fact only the Clayton-Bulwer Treaty in new and tighter form, in all the points which had become most obnoxious. The "Davis Amendments," proposed in committee, practically nullified the neutrality feature, but neither it nor the main treaty had been acted upon when the Senate adjourned in June. The period for ratification was extended to 5 March 1901; but the platforms of both parties insisted on exclusive American control. The amendments added to it in the following session of Congress made it unacceptable to Great Britain, which refused to ratify it, and it expired by its own limitation. The two statesmen, however, drew up another, less satisfactory in some respects than the old, and which specifically abrogated the Clayton-Bulwer Treaty, but succeeded in saving its general principles of neutralization (see HAY-PAUNCEFOTE TREATY); and it was ratified 16 Dec. 1901. By the irony of fate, this question of the control of a Nicaragua canal, so burning for half a century, and menacing war more than once, seems to have been dealing with a contingency never to happen, as the entire subject-matter was set aside in favor of the Panama Canal (q.v.). Consult Travis, ‘The History of the Clayton-Bulwer Treaty’ in Vol. III of ‘Publications of the Michigan Political Science Association’ (Ann Arbor, Mich., 1900).

CLAYTONIA, a genus of plants of the purslane family (*Portulacaceæ*), so named in honor of the American botanist, John Clayton (q.v.). It is among the earliest and most beautiful of the American wild-flowers, these two qualities giving it its common name of spring beauty. There are at least 25 species, most of them natives of North America. The plants grow in damp woods and wet places, and are found at all elevations up to 5,000 feet, in the region of Nova Scotia, south to the Gulf and westward to the Pacific Coast. The plants are low succulent herbs, the delicate rose-colored flowers striped with pink veins, and the leaves linear or oblong. *C. perfoliata,* Spanish lettuce, common from British Columbia to Mexico, is used as an anti-scorbutic in household medicine. *C. tuborasa,* a native of Siberia, supplies a root that is eaten by the natives.

CLE ELUM, Wash., city in Kittitas County, 100 miles southeast of Seattle, on the Chicago, Milwaukee and Saint Paul and the Northern Pacific railroads, and on the Yakima River. It is a coal-mining and agricultural centre and has dairying, fruit-growing and lumber industries. It contains a hospital and owns its waterworks. The city was founded in 1887 and was incorporated in 1905. Pop. 2,749.

CLEANTHES, klē-ăn′thēz, Greek Stoic philosopher of the 3d century B.C. He was a native of Assos, in Lydia, but, visiting Athens, became a zealous disciple of Zeno. In order to attend on that master in the day, he was accustomed to labor by night. His mental and his bodily strength were immense, and despite all obstacles, he studied so successfully as to become Zeno's successor, 263 B.C. Of his writings only some fragments remain, among which is his noble ‘Hymn to Zeus’ preserved by Stobæus (ed., 1, 2, 12). The fragments have been collected by Wachsmuth, ‘Commentatio de Zenone et Cleanthe’ (1874); and Pearson

(Cambridge 1891). Consult Ritter and Preller, 'Historia Philosophiæ Græcæ' (Gotha 1888); Zeller, 'The Stoics, Epicureans and Sceptics' (trans. by Reichel, London 1892); Adam, 'The Vitality of Platonism' (containing the translation of the 'Hymn to Zeus,' Cambridge 1911).

CLEAR, Cape. See Cape Clear.

CLEAR LAKE, a body of water lying in a picturesque region in Lake County, Cal., 110 miles north of San Francisco. It is 25 miles long, and from 2 to 10 miles wide. The outlet is Cache Creek.

CLEAR LAKE, Iowa, a city in Cerro Gordo County on the lake of the same name. The Chicago, Milwaukee and Saint Paul and the Mason City and Clear Lake railroads connect with the town. The principal industry of the city is ice transportation. There are three banks whose combined resources amount to $1,100,000. There are schools, a city hall and a Carnegie library. It is popular as a summer resort. Pop. 3,500.

CLEARANCE OF VESSELS, the examination of them by the proper custom-house officers, and the giving of a certificate that the regulations have been duly complied with. Vessels are said to clear inward or outward according as they arrive or depart.

CLEARCHUS, klē-är'kŭs, Spartan general who commanded about 13,000 Greeks in the army of Cyrus the Younger when that Persian prince tried to wrest the throne of Persia from his brother, Artaxerxes II. When Cyrus was defeated at Cunaxa (401 B.C.), Clearchus and his chief officers were seized by treachery and put to death. Consult Xenophon, 'Anabasis'; and the account in Smith, 'Dictionary of Greek and Roman Biography and Mythology' (Boston 1849).

CLEARFIELD, Pa., the county-seat of Clearfield County, on the Susquehanna River (west branch), and on the Pennsylvania Railroad. It is situated in the west-central part of the State, and is surrounded by a rich agricultural region, underlying which are deposits of coal, fire-clay and limestone. It has several novelty works, lumber mills, flouring mills, planing mills, brickyards and a steel plant, and has manufactories of sewer pipe, clay-working machinery, refrigerators, cut glass, silk velvet, knitting machines, wagons, swings, foundry products, tanned leather, etc. Clearfield was settled in 1805, and in 1840 was incorporated as a borough. Pop. 6,851.

CLEARING HOUSE, The. See Banks and Banking — The Clearing House (Article 7).

CLEARING-NUT, a small tree (*Strychnos potatorum*) of the same genus as the *nux vomica,* the seeds of which are used in India for settling or clearing muddy water. The seeds are rubbed upon the inside of the water-vessel, and within a few minutes after the water has been introduced it becomes clear, the sediment and non-soluble ingredients having sunk to the bottom. The wood is very hard and heavy, and is used for cabinet-making and house-building.

CLEARSTORY. See Clerestory.

CLEARWING, a small moth with transparent wings, the caterpillars of which are the borers that destroy peach-trees and fruit-bushes. Although common in America they are mostly importations from Europe or Asia.

CLEARY, James Vincent, Canadian clergyman: b. Waterford, Ireland, 18 Sept. 1828. He was educated at Royal College, Maynooth, and ordained to the Roman Catholic priesthood in 1851. He became president of Saint John's College, Waterford, in 1873, and in 1880 was appointed bishop of Kingston, Canada, the see being made an archbishopric in 1889. In 1896 he reopened the Theological Seminary of Regiopolis College in Kingston.

CLEAVAGE. Many crystallized substances when sharply struck or subjected to pressure or heat or other disturbing forces split into fragments bounded by smooth plane surfaces which are parallel to crystal faces of the substance.

If the separation can be obtained with equal ease in any part of any crystal and if there is only a mechanical limit to the thinness of the resulting plates this tendency to break parallel to crystal faces is called *cleavage.* If, however, the separation can be obtained only at irregular intervals, and only in some crystals, the character is called *parting,* and has a different origin.

Cleavage occurs with equal ease parallel to all corresponding crystal faces, thus, for instance, a crystal of galena will cleave equally well parallel to all the faces of the cube. Cleavage is due to differences in cohesion, and conforms strictly to the theory of a regular internal structure. (See Crystal). The breaking in one direction more easily than another implies differences of cohesion in different directions, and the break is a plane because all lines perpendicular to it are directions of equal minimum cohesion, and finally the cleavage with equal ease parallel to corresponding faces implies equal cohesion at right angles to all of these.

A structure model shows not only that among the different sets of parallel molecular planes those parallel to the common crystal faces contain the largest number of molecules but also that the consecutive planes of such a set are furthest apart from those of other sets, and being further apart there is weaker cohesion.

The ease of cleavage is not a measure of the absolute strength of cohesion but a proof of marked differences in cohesion in different directions. Diamond and fluorite illustrate this. The property is shown equally well by the polyhedral and the faceless crystal independent of the external form.

Cleavage is in general limited to directions parallel to symmetry planes or perpendicular to axes of symmetry or parallel to the faces of prominent crystal forms. It may occur in the same substance parallel to the faces of two or more crystal forms; for instance, gypsum splits easily into plates parallel to the faces of one form and these plates again break parallel to the faces of two others.

Directions of cleavage are sometimes indicated by a pearly lustre, due to repeated light reflections from cleavage rifts, or distinct cracks may occur. The absence of these is not proof that cleavage cannot be obtained, but only that the separation has not been started.

Cleavage is usually obtained by resting the crystal on a firm support, placing the edge of a knife or small chisel parallel to the supposed direction of cleavage and striking a quick, sharp blow upon it with a hammer. In some instances the cleavage is only obtainable by such methods as heating and suddenly plunging into cold water.

Cleavage is a valuable aid in classification and identification, the number of directions, the relative ease and above all the characteristic angles leading to rapid and safe conclusions.

CLEAVAGE, Rock. See ROCK CLEAVAGE.

CLEAVELAND, Moses, American pioneer: b. Canterbury, Conn., 29 Jan. 1754; d. there, 16 Nov. 1806. He was graduated at Yale in 1777, and began the practice of law in his home town, being several times elected to the legislature, and in 1796 commissioned a brigadier-general of militia. He was a leading shareholder in the Connecticut Land Company which had bought for $1,200,000 the land in northeastern Ohio reserved to Connecticut by Congress, and subsequently known as the Western Reserve. In 1796 Cleaveland went out with a party of 50 to survey the tract and arrange for its settlement by white emigrants. After successfully negotiating with the Indians who claimed certain rights to the region, the party arrived at the present site of Cleveland, 22 July 1796. Cleaveland immediately chose it as a place for his settlement, surveyed it into town lots, and the members of the party named it Cleaveland in his honor. In 1830, when the Cleveland *Advertiser* was founded, the headline was found too long for the form; the editor therefore dropped the letter «a» in the first syllable of the city's name, and the new spelling of Cleveland was soon generally adopted.

CLEAVELAND, Parker, American mineralogist: b. Rowley, Mass., 15 Jan. 1780; d. Brunswick, Me., 15 Oct. 1858. He was graduated at Harvard 1799, and was appointed tutor there 1803. In 1805 he was chosen first professor of mathematics and natural philosophy at Bowdoin College. Applying himself with energy to the new sciences of chemistry and mineralogy, his studies resulted in a treatise on 'Mineralogy and Geology' (1816; 2d ed., 1822; 3d ed., 1856), which brought him the offer of the chair of mineralogy in Harvard, which he declined, as he likewise did the presidency of Bowdoin in 1839. He stood first in his subject in this country, was a popular and lucid lecturer, an enthusiastic and inspiring teacher. When the medical school was founded at Bowdoin in 1820 he was made its dean and librarian.

CLEAVERS, one of the 70 common names applied to certain species of bedstraw (q.v.), of the madder family, occurring throughout the whole United States; troublesome weeds, probably naturalized from Europe. Other names by which they are known are goose-grass, catchweed, beggar-lice, burhead, clover-grass, cling-rascal, scratch-grass, wild hedge-burs, stick-a-back or stickle-back, gosling-grass, gosling-weed, turkey-grass, pigtail, grip or grip-grass, loveman and sweethearts. They are as common in Europe as in America, and seem not to be much used except in Sweden, where for many years their prickly stems have been used as strainers for milk. They have sometimes been used for a yellow stain to color cloth or cheese. Cleavers was formerly of repute in household medicine as a diuretic, but is now so used only in the most remote settlements.

CLEBSCH, kläpsh, **Rudolf Friedrich Alfred,** German mathematician: b. Königsberg, Prussia, 1833; d. Göttingen, 7 Nov. 1872. He was educated at Königsberg, where his masters included Hesse, Richelot and F. Neumann. From 1858 to 1863 he was professor of theoretical mechanics at the Karlsruhe Polytechnic School. In 1863 he became professor of mathematics at Giessen and at Göttingen in 1868. With Neumann he founded in 1868 the *Mathematische Annalen.* He is prominent as a geometrist because of his contributions to the theory of invariants and his use of the notion of the deficiency of a curve and his applications of the theory of elliptic and Abelian functions to geometry. He wrote much also on the general theory of algebraic curves and took a prominent part in solving the generalized form of Malfatti's problem, and the Pfaffian problem of differential equations. For an estimate of Clebsch consult *Mathematische Annalen* (Vol. VII); Lindemann edited his 'Vorlesungen über Geometrie' (Leipzig, Vol. I, 1876; Vol. II, 1891; new ed., 1906).

CLEBURNE, Patrick Ronayne, American soldier: b. Cork County, Ireland, 17 March 1828; d. Franklin, Tenn., 30 Nov. 1864. While a student at Trinity College, Dublin, he ran away and enlisted in the English army, in which he served for three years. He came to America, settled in Helena, Ark., studied law and practised successfully until the Civil War. Joining the Confederate army as a private, he rose rapidly to a brigadier-generalship, commanded a brigade at Shiloh, was wounded at Perryville and commissioned major-general, December 1862. He distinguished himself greatly in many fierce engagements, notably at Murfreesboro, Chickamauga, Ringgold Gap and Missionary Ridge, receiving the thanks of the Confederate Congress. He was killed at the battle of Franklin, after carrying two lines of Union works, and shortly after saying to General Hood: «I have more hope in the final success of our cause than at any time since the first gun was fired.» He was a soldier of quick perception and strong character, and early and boldly advocated freeing the slaves, and the enlistment of the young and able-bodied negroes in the Confederate service. He was called the «Stonewall of the West,» and instituted the Order of the Southern Cross. Consult the biographical speech by General Gordon (in *Southern Historical Society Papers,* Vol. XVIII, Richmond 1889).

CLEBURNE, Tex., the county-seat of Johnson County, on the Trinity and Brazos Valley, the Missouri, Kansas and Texas and the Gulf, Colorado and Santa Fé railroads. It carries on a large trade in grain, live stock, cotton, wool, hides and produce, and has cotton compresses, cottonseed-oil mills, flour mills, foundry and machine shops, and shops of the Gulf, Colorado and Santa Fé Railroad. The courthouse, Carnegie library and high school are notable features. There are municipal waterworks. Pop. (1910) 10,364, being more than treble that of 1890, when it had a population of 3,278.

CLECKHEATON, klĕk-ē'-tŭn, England, town in the county of York, West Riding, situated on a declivity in the Spen Valley, five and one-half miles southeast of Bradford. It is well built, has a technical institution, handsome premises belonging to the co-operative association, a fine town-hall; large trade in textiles, card wire manufacturing and machinery. Pop. 12,866.

CLEEF, klāf. 1. Joost (*yoost-*) Van, called Zotte (mad) Cleef: b. Antwerp about 1510; d. about 1559. He was one of the most celebrated painters of his time, and in regard to beauty of coloring may challenge comparison with the most distinguished Italian masters. His excessive vanity and eccentricity caused him to be described as «mad.» A portrait of him and his wife are to be found in the gallery of Windsor. Althrop possesses his portrait. 2. Jan (yăn) Van, a painter: b. Venloo, Guelderland, 1646; d. Ghent 1716. He was a pupil of De Cayer, and belongs to the Flemish school, of which he is one of the most eminent masters. His works, which resemble those of Poussin, are particularly remarkable for beauty of design and coloring. The churches of Ghent are adorned with many of his paintings, in which the heads of children and the countenances of women are very beautiful.

CLEF (Fr. for key), a character placed at the beginning of a staff to show the elevation of that particular staff in the general claviary or system, and to determine the names of the notes according to their positions on the staff. See Musical Elements and Terms.

CLEFT PALATE. Cleft palate is the result of failure of union, in embryo, of the elements of which the palate is composed. Cleft palate, including the velum, uvula, hard palate and alveolar process, with harelip, either single or double, invariably is congenital.

Defects of the palate resulting from trauma or disease do not occur as frequently as congenital defects.

Every developing child, prior to the second month of gestation, has a cleft palate. A child who has a *complete* congenital cleft palate, has in the palate at birth, with rare exceptions, the normal amount of tissue, although it is not united in the middle line. It is cleft. Nature does not often fail to develop the necessary tissues to form a normal palate, but sometimes does fail to bring them into apposition and unite them. Cleft palate is not, therefore, with few exceptions, due to arrested development nor absence of palatal tissues, but, as the child's age advances, the arch spreads and the muscles, for want of proper activity due to the separation, fail to develop as the other muscles do that are normally employed.

There are, anatomically, 15 forms of cleft palate, some but slightly and others widely differing in deformity and treatment.

The simplest form is a cleft of the azygos uvula only. The most complicated form presents a complete cleft of the soft and hard palate; the vomer is separated from the hard palate; the premaxillary bones are not only separated from the hard palate, but often protrude far beyond the tip of the nose, with the further complication of double harelip which sometimes, though rarely, extends to the eyes. The nostrils are abnormally broad and flat. In cases of single harelip and cleft palate, the vomer is nearly always attached to the long side of the palate.

There are six centres of ossification in forming a palate — two premaxillary, two maxillary and two palatal. These six bone centres carry with them other tissues, the soft parts consisting of periosteum, mucous membrane, connective tissue, etc. All these centres are assembled during the formation of the palate, like a piece of machinery. If nothing interferes with the bones meeting and uniting, the palate will be normal. If, however, from any cause the bones fail to unite, the child will have a cleft palate, accompanied very frequently by harelip.

Cleft palate seriously interferes with deglutition in a young infant. The child, consequently, is poorly nourished. The open palate makes it difficult for the child to draw its milk, and what little it may get often regurgitates through the nose. A cleft palate nipple used with the bottle, or artificial velum which is employed in conjunction with the breast, will enable the child to swallow its food without difficulty. The English author, Lawson Tait, has stated that the mortality of children who have cleft palate is so great by reason of their failure to secure proper nutrition, that an early operation is desirable.

Etiology of Cleft Palate.— The literature of this subject is voluminous and largely conjectural. Among the causes assigned are heredity, maternal pre-natal impressions, defective nutrition during the early months of gestation, intervening mucosa in tooth enamel formation, uterine inflammation, venereal diseases and pressure. These causes may be divided into two classes: *Predisposing* and *Exciting*.

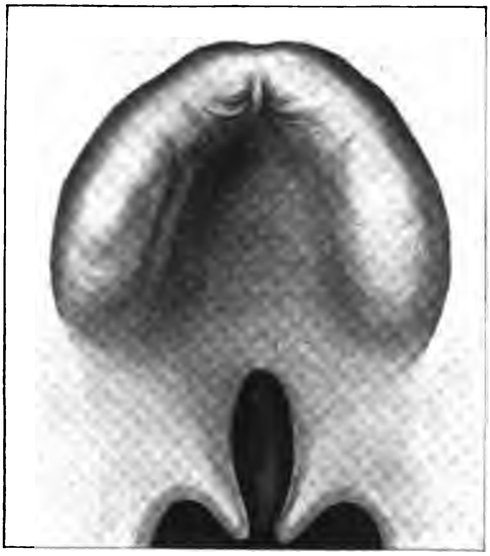
PREDISPOSING CAUSES OF CLEFT PALATE.

Heredity.— The factor of heredity is so well recognized that reference to it here might seem unnecessary. In many cases the physical characteristics of the parents, normal or abnormal, may be observed in their children. The shape of the head, nose, eyes and other features often resemble those of a parent. The parents may have normal palates while a grandparent or even a great grandparent (and, no doubt, progenitors further back of whose physical conditions the parents know nothing), having had the defect, transmitted it to grandchildren or to generations even more distant.

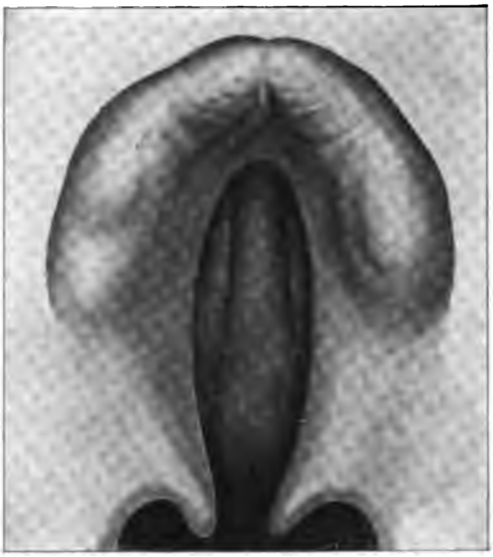
It is thus the law of atavism, or reversion to type, asserts itself. The statement often made by parents, that no ancestor ever had a cleft palate or harelip, applies usually only to their grandparents whom they have known. As to those further back, as a rule, they know nothing.

Maternal Pre-natal Impressions.— Maternal pre-natal impressions are firmly believed in by many mothers, but proof that cleft palate has been due to such impressions has never been established. At the ninth week of embryonal life, or about the close of the second month, the fissures about the orbit and bones of the palate have been effaced and the bones are united. The fright or shock which the mother sustained, to which she ascribes her child's defect, as a rule, occurred subsequent to the time when nature completes the union of the

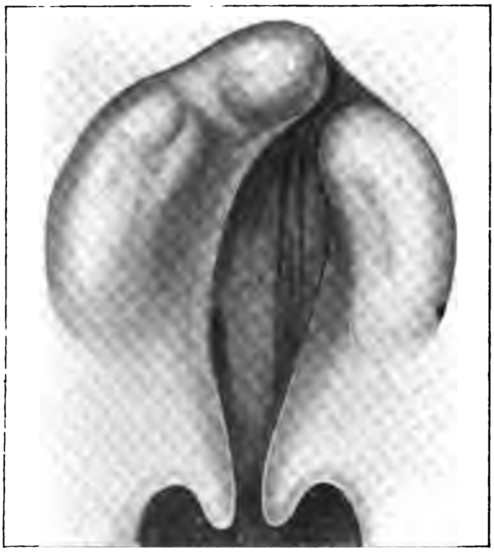
CLEFT PALATE



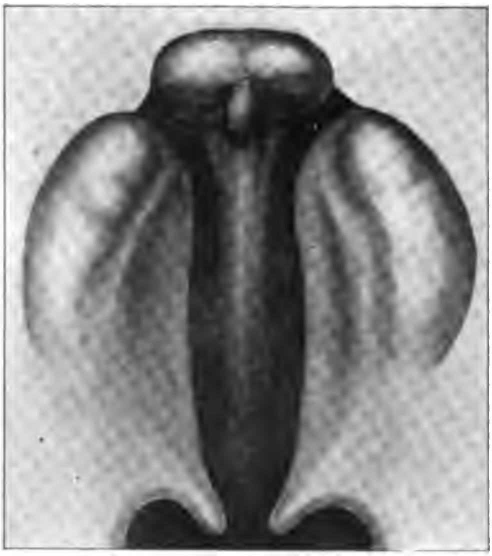
1 Cleft extending through the uvula and forward to the posterior border of the horizontal plates of the palate bones



2 Cleft of entire soft palate and the hard palate nearly as far forward as the original line of union between the palatal paltes of the maxillary bones and the premaxillary bones



3 Complete single cleft of the entire soft and hard palate, usually accompanied by single harelip. The maxillary bone is separated from the premaxillary bone



4 Tripartite cleft, extending through soft and hard palate, separating premaxillary bones from the maxillary bones. Often complicated with double harelip

Forms 1 and 2 should not be operated until between 12 and 18 months, just before speech is attempted; forms 3 and 4 should be operated in early infancy, prior to the sixth month. The bones should be approximated before the harelip is operated

various bony elements which form the palate. After the bones are united no shock, however severe, could separate them.

Defective Nutrition.— Defective nutrition or general debility of the mother during the early months of gestation, from any cause, may delay union of the palatal plates. Nature does not, as a rule, fail to develop the necessary bone and soft parts to form a normal palate, but it does fail to bring the parts in apposition and unite them.

Mothers who have suffered from a severe illness during the first 10 weeks of gestation may be so poorly nourished as to bear a child with cleft palate or other deformities. A pregnancy shortly following the birth of a child often draws heavily upon a mother's vitality, especially if she is not strong, and the enfeebled condition may be followed by deformity of her child.

Intervening Mucosa in Tooth Formation and Supernumerary Dental Rudiments as Factors.— Professor Warnekros holds that cleft palate is always due to the rudiments of supernumerary teeth. Among the many causes that have been assigned for failure of union of the palate within the first two months of embryonal life, the one advanced by the late Dr. C. F. W. Bödecker is, I believe, most to be relied upon. It is based upon anatomical and physiological grounds. He believed that the membrane from which supernumerary teeth, or any other teeth, were developed prevented union of the bone.

We know that in the formation of the teeth, the mucosa dips deep down into the submucous tissue and forms the epithelial lamina, which contracts into the epithelial cord at the distal end of which the enamel organ is formed. It is too well known to admit of discussion that a layer of epithelium, under certain conditions, will form an obstruction to union of the tissues between which it intervenes.

It seems that Bödecker's conclusion, namely, that this epithelial cord delays union of the parts forming the maxillæ; and the force exerted by the tongue and mandible from the beginning of the third month until birth and several months later, would account for the broad separation of the maxillary bones and the creation of the cleft.

Venereal Disease and Uterine Inflammation. — The influence of venereal disease on the developing child unquestionably causes many physical defects. Likewise, inflammation of the uterus might easily affect the development of the palate as well as other parts.

EXCITING CAUSES OF CLEFT PALATE.

Pressure.— In early intra-uterine life, between the second and third months, the tongue is much thicker than at birth. It occupies a great deal of space between the developing bony plates of the palate, and may interfere with the bones meeting and uniting.

At the third month the muscles of mastication become active and the mandible brings pressure on the soft, flexible un-united bones of the palate and, acting as a wedge, mechanically forces them further apart, thus widening the breach.

If an examination be made of a young child with a complete cleft palate, it will be noticed that the upper alveolar ridge is outside of the lower ridge. The upper arch is, therefore, spread by the wedge formed by the lower jaw.

The normal position of the fœtus in utero is such that the weight of the entire fœtal body may be readily thrown upon the vertex and the pressure thus exerted would tend to force the mandible into contact with the sternal region and compress it against the forming hard palate. The flexed position of the head, with the symphysis of the mandible resting on the sternum, may contribute to some extent to the force which is exerted by the mandible. It is generally accepted that the lower jaw acts as a matrix or mold upon which the upper jaw is formed.

Treatment of Cleft Palate.— The object to be attained in operating on cleft palate and harelip is not only to overcome the visible deformity, but to ensure, as nearly as possible, correct phonation.

The importance of the palate as an organ of speech is often overlooked, and the following quotation from the late Dr. G. Hudson-Makuen, noted author on voice-production, shows the necessity of a normal palate for perfect phonation:

> "There is a popular notion that the tongue is the chief organ of speech and that the sense of taste is located in the palate. Both the palate and the tongue are important organs of speech, but the former is more so, for not only is it essential in the enunciation of nearly all the elements of speech, but, owing to its direct attachment to the larynx, it is also an important factor in the production of voice. The vowel sounds may be articulated when the palate is defective, but their resonance is so much impaired that they are scarcely recognizable, and their pitch cannot be changed with any degree of accuracy. It is in the articulation of consonant sounds, however, that the palate is especially essential."

When to Operate.— The time to treat a cleft palate is as early after birth as possible, preferably within the first month, when the separated bones of a cleft palate should be closed.

Palate Surgery is Bone Surgery.— A palate can never be normal unless the bones are united. Bone surgery, therefore, is necessary when the bones of the hard palate and the alveolar process are separated.

Steps in Operating.— Three steps are called for: (1) The bones should be united and the nose placed in its normal position. (2) The lip should be closed, usually about four weeks after the bone operation. (3) Finally, the soft palate should be closed so that the patient, when becoming old enough to speak, will speak distinctly. This is done about the 14th month.

The cleft should be closed before ossification of the bones is far advanced, while they may be bent and moved without fracture. Bone at birth is about one-half organic matter, hence it is not difficult to bend the bones and close the cleft a few days after birth. Protruding pre-maxillary bones should never be removed, but should be fixed in the arch and held firmly in place until they unite with the maxillary bones and complete the arch.

The highest degree of success in the treatment of cleft palate is obtained by operating in early infancy, at which time the operation is more safely performed, but successful operation may be made at any time in life. If the patient has a harelip only, it may be operated upon at any time.

TRUMAN W. BROPHY, M.D.

CLEISHBOTHAM, klēsh'bŏth-am, **Jedediah,** a character in Scott's 'Tales of My Landlord,' who is represented to have collected the stories, of which Peter Pattieson is the imaginary writer.

CLEISTHENES, klīs'thē-nēz, or **CLISTHENES,** an Athenian politician who flourished about 500 B.C. He was the grandson of Cleisthenes of Sicyon, and the son of Megacles, and at the end of the rule of the Pisistratidæ (510 B.C.) was a leader of their enemies. When, with the assistance of the Delphian oracle and the Spartans, Hippias was banished from Athens, Cleisthenes, in order to secure his ascendancy over his rival Isagoras, chose to defend the cause of the people and succeeded in introducing some important changes in the ancient constitution of Athens; among others, the division of Attica into 10 instead of 4 tribes, each consisting of several *demi,* under demarchs; the increase of the number of the senators from 400 to 500, 50 of each tribe; and, as some say, the law of ostracism (q.v.), so remarkable in the history of that state. Cleisthenes, being suspected of the desire of tyrannical power, was himself banished, but afterward returned and triumphed over his enemies.

CLEISTOGAMOUS FLOWERS (from Gk. κλειστός, closed, and γάμος, marriage). In most of our familiar plants the flower is open to the air, so that there is a possibility of cross-fertilization. Indeed, in many plants, such as the primrose, the gentian, etc., self-pollination is rendered difficult or impossible by the structure and development of the flower. In other plants, however, among which are the dog-violet, Impatiens fulva, Impatiens noli-me-tangere, etc., the reproduction of the plant is carried on in part, at least, by flowers that never open, and are hence of necessity self-pollinated. These flowers are called *cleistogamous.* They are more or less abortive: their petals are absent or stunted and colorless, and they lack the nectar and scent that attract insects in other blossoms.

No plants are known which possess only cleistogamous flowers. For example, in the dog-violet we find in addition to the fertile cleistogamous flowers the showy but usually sterile blossoms which alone are known to the casual observer. The sterility of the ordinary flowers of the dog-violet is due, not to any intrinsic defect of the pistil or the germs included therein, but to the fact that the anthers often contain no pollen, and still more to the fact that they are not frequented by bees. When artificially fertilized the open flowers yield as much seed as the cleistogamous ones.

A very interesting fact about some cleistogamous flowers, such as that of the dog-violet (*Viola canina*) is that the pollen-grains give rise to their tubes *in situ.* These must find their way from the anthers across the cavity of the flower to the stigma before they can fertilize the ovules. The mechanism of this peculiar process is not at all understood.

According to Darwin, the cleistogamous flowers are not merely ordinary flowers in a state of arrested development, as the existence in certain cases of a very complete series of transitional forms between the cleistogamous and the perfect flowers might seem to show, but have undergone modifications which fit them especially for self-fertilization. They form a kind of insurance to the plant against interruption of the more customary modes of fertilization, and this may have caused their evolution in plants which already had a tendency to mature some of their flowers before they were completely open. Consult Darwin, C., 'Forms of Flowers' (London 1877).

CLÉLIE. In 'Clélie' Madeleine de Scudéry undertook to do for Parisian bourgeois society what she had done for the aristocratic *précieux* in 'Le Grand Cyrus.' The first volume of 'Clélie' appeared in 1654, the tenth and last in 1660. Together they count over 8,000 pages. The scene opens in ancient Carthage, soon shifts to Capua and thence to Rome, but without the least effort at historic detail. The heroine is the daughter of a Roman exiled by Tarquin, her lover a son of Lars Porsena. Much is said of Brutus, Tarquin, Lucretia, the last masquerading as a past-mistress in *précieuse* coquetry, whose death leaves the reader as cold as it apparently did the author. The interest of 'Clélie' is not in the story and never was, but in the 73 characters, each painted from life, each picturing some wealthy bourgeois with aspirations to culture, some *précieuse ridicule* or perhaps some Madame Scarron, with a few from higher spheres, among whom may be named Louis XIV (Alcandre), his finance minister, Fouquet (Cléomine) and Mlle. de Longueville (Clélie). What did most to make 'Clélie' a sensation in its day, stamped it as a manual of gallantry, and has preserved its memory till ours, was its "Map of Tenderland," watered by the rivers of Inclination, Esteem and Gratitude, with many allegorized cities, many by-ways and false paths to places whose names suggest stages of flirtation, frivolity, gallantry and so on, with a Dangerous Sea and, beyond, an "unexplored land," the whole a sort of preliminary study for a psychological novel, not without ingenious originality, though the general idea of an allegorical map was old.

BENJAMIN W. WELLS.

CLEMANGES, klā-mänzh, **Mathieu Nicolas,** French theologian: b. Clemanges 1360; d. about 1430. He studied at Paris under Pierre d'Aille and Gerson. In 1391 he was professor of theology at the University of Paris, and in 1393 became rector there. In the hope of helping to heal the Papal Schism of the time, he accepted the position of private secretary to Benedict XIII, the anti-pope at Avignon; but when Benedict excommunicated the French king in 1407 Clemanges resigned his office and lived in voluntary exile with the Carthusian monks. Here he devoted himself to his studies and writing, endeavoring to correct abuses in the Church, and seeking to place the study of theology upon a wider basis: his writings had much influence on the deliberations of the Council of Constance. In 1425 he went back to Paris where he continued to lecture at the College of Navarre until his death. His works were collected and published by Lydius (1613). Consult Müntz, 'Nicolas de Clémanges, sa vie et ses écrits' (Strassburg 1846); and Creighton, 'A History of the Papacy' (London 1882).

CLEMATIS, a genus of climbing vines or ascending herbs, of the crowfoot family (*Ranunculaceæ*). It numbers upward of 150 species, and is widely distributed throughout the temperate regions of the world. In the United States between 20 and 25 species are recognized. The best known is the virgin's-bower (*C. virginiana*), a vine that climbs over shrubs and along fences. It is common from Nova Scotia to Georgia, and west to Kansas and Manitoba. Its sprays of white flowers make a showy appearance from July through September. Other species are found west of the Mississippi River, extending to the Pacific Coast, and south to the Gulf of Mexico. The only English species (*C. vitalba*) is called traveler's joy. Many species, chiefly of Asiatic origin, are commonly cultivated because of their showy flowers.

CLÉMENCEAU, Georges Benjamin Eugène, è-zhän klā-mŏṅ-sō, French editor and statesman: b. Château de l'Aubraie, Feole, Vendée, 28 Sept. 1841. He studied medicine at Paris, and began the practice of his profession there.

Before he was 20 Georges was thrown into prison for shouting «Vive la République!» on the streets of Paris, in the midst of the celebration of one of the Imperial anniversaries. He served his term in jail, and then, practically an exile, he came to America.

Between 1865 and 1869 he lived in the United States, chiefly in New York and in Stamford, Conn. Before he left France he had made the acquaintance of William E. Marshall, the artist who made the famous engraving of Lincoln, and it was as his friend, and indeed upon his invitation, that the young physician came to New York. During his stay there Clemenceau studied American ideas, conditions of living, government and language. He had had an academic knowledge of English when he left France; it soon became idiomatic. He traveled, too, visiting the Middle West, and going as far south as Richmond. But he could not travel further in the South, he said, because the condition of that section of the country, just defeated in the Civil War, was too sad for him to contemplate. He returned to New York, was a constant reader at the Astor Library, and made a number of good friends, especially Eugene Bushe, a lawyer, who was his neighbor on 12th Street. When Clemenceau failed to build up a medical practice and the money that he got from France proved insufficient, Bushe introduced him to the mistress of a girls' boarding school, a Miss Aiken, who employed him as teacher of the French language and literature in her «young ladies' seminary» at Stamford.

There Clemenceau translated the works of John Stuart Mill into French, was an indefatigable student of American politics and became known as a serious scholar. Early in 1870, he left the school where he had taught for two and a half years, and returned to France.

Throughout the Franco-Prussian War and the siege of Paris Clemenceau was mayor of the district of Montmartre. One of his duties during the siege was to see that 150,000 men were properly fed. Another was to look after thousands of refugees. He was also responsible for large amounts of money, and they tell a story that, foreseeing the accusations against any one's honesty that might be made in those trying days, he took the precaution of engaging an expert accountant to «check up» and make public his use of every sou of public funds. At the end of the war he did all he could to gain «home rule» for Paris, and then found himself the enemy of the Commune. In 1871 he was elected to the General Assembly, and it is interesting to note that he was opposed to a treaty of peace. From 1871 to 1875 he was a member of the Paris Municipal Council, of which he became president, and in 1876 he was elected member from Montmartre in the Chamber of Deputies, where he soon became leader of the Radicals. From the outset of his career in the French Parliament he was the bitter opponent of the Royalists, and soon became known for his eloquence and independence of action. Men could not predict the action of Clemenceau. He was independent even in his radicalism, and he followed no leader but his own principles. They called him the undisciplined vandal in those early days when he was making a reputation as an upsetter of other men's careers.

His political power was increased by his journalistic activities. In 1880 he founded *La Justice*, the great daily paper, of which he became chief editor. He destroyed the Fourton-Broglie administration. He overthrew Boulanger. He caused the fall of Jules Grévy and of Jules Ferry. He wrecked the activities and position of M. Freycinet at least three times. Yet his own policy was a consistent radical Republicanism, clear and practical; he stood for the realization of all that the Revolution had hoped and dreamed. He was opposed, we may note, to the alliance with Russia, determined that his country should not be joined in so close a friendship with a despotic power. He unceasingly upheld the complete separation of Church and state. He urged constantly the development of French resources to the utmost. And those who have watched his career closely point out the growth of the man's political philosophy from his early reckless radicalism to the saner advocacy of a just and free democracy.

But in 1893 he fell. He fell with a completeness that was universally believed to be hopeless. He was disgraced, finished. He was accused of complicity in disloyalties and dishonesties in connection with the Panama Canal scandals. He met every charge against his integrity. The attack on him in the Chamber utterly broke down. But his own constituents turned against him. He was literally put out of politics. For nine years he had no connection with the government of France. But two years after his overthrow a very different Clemenceau made his appearance in the world of French letters. The wily politician, the reckless duelist, the insolent hounder of his foes, was gone. In his place was a philosopher and littérateur, a man who wrote exquisite prose, a lover of nature, a friend of humankind. Among his writings during that period were a book on the philosophy of nature, 'Great Pan'; a novel of social life, 'The Strongest'; a play of which the scene was laid at the court of China, and some notable criticisms. But he returned in a few years to journalism. His old paper had gone down in the wreck of its chief's career. But when the Dreyfus affair suddenly burst upon France, a new journal, *L'Aurore,* edited by M. Clemenceau, made its appearance. It was devoted to the proving of Dreyfus's innocence. Clemenceau was back in the active world of French affairs with a vengeance. With his tireless defense of Dreyfus, he became, as some one has said, «the sentient conscience of France in print.» It was in Clemenceau's paper that Zola published his famous 'J'accuse.' Month after month Clemenceau wrote articles of which Sydney Brooks states: «They remain, I suppose, the most brilliant masterpieces of polemics that French literature has produced since Pascal's famous 'Provincial Letters.' At the time of their appearance their effect was prodigious. No publicist did more, very few did as much, to guide French opinion through the mazes of that exhausting crisis.» And the political world that Clemenceau thus dramatically re-entered, he has never left. In 1902 the same constituency that had forsaken him in his hour of trial returned him triumphantly to the Senate. In the spring of 1906 he was appointed to public office as Minister of the Interior. In November of that year, upon the retirement of M. Sarrien, he became Premier. While he was in office the most important thing that happened was the great miners' strike, which the Socialists organized. Knowing his revolutionary tendencies, the miners expected his sympathy, especially when he went personally to investigate their complaints. But with the first outbreak of violence Clemenceau became a ruler of iron. The soldiers were called out and the riots were put down. Clemenceau found himself attacked by the Socialists and involved in a personal controversy with Jaurès. But when he asked the latter whether he, in a position of authority, would have acted differently, the Socialist leader was unable to reply. In 1909 his old enemy, Delcassé, rose up suddenly and overthrew his Ministry. A discussion over naval affairs sprang up almost over-night. There were scandals, investigations, controversies. In a verbal duel with Delcassé — in the early years of Clemenceau's activity his duels were frequently not verbal — the Premier, to quote a newspaper dispatch, «seemed, for the first time in his Parliamentary career, to lose his head.» Certainly he lost his temper, declared that Delcassé had «humiliated France,» and stalked out of the room. The President shortly after offered the Premiership to M. Leon Bourgeois.

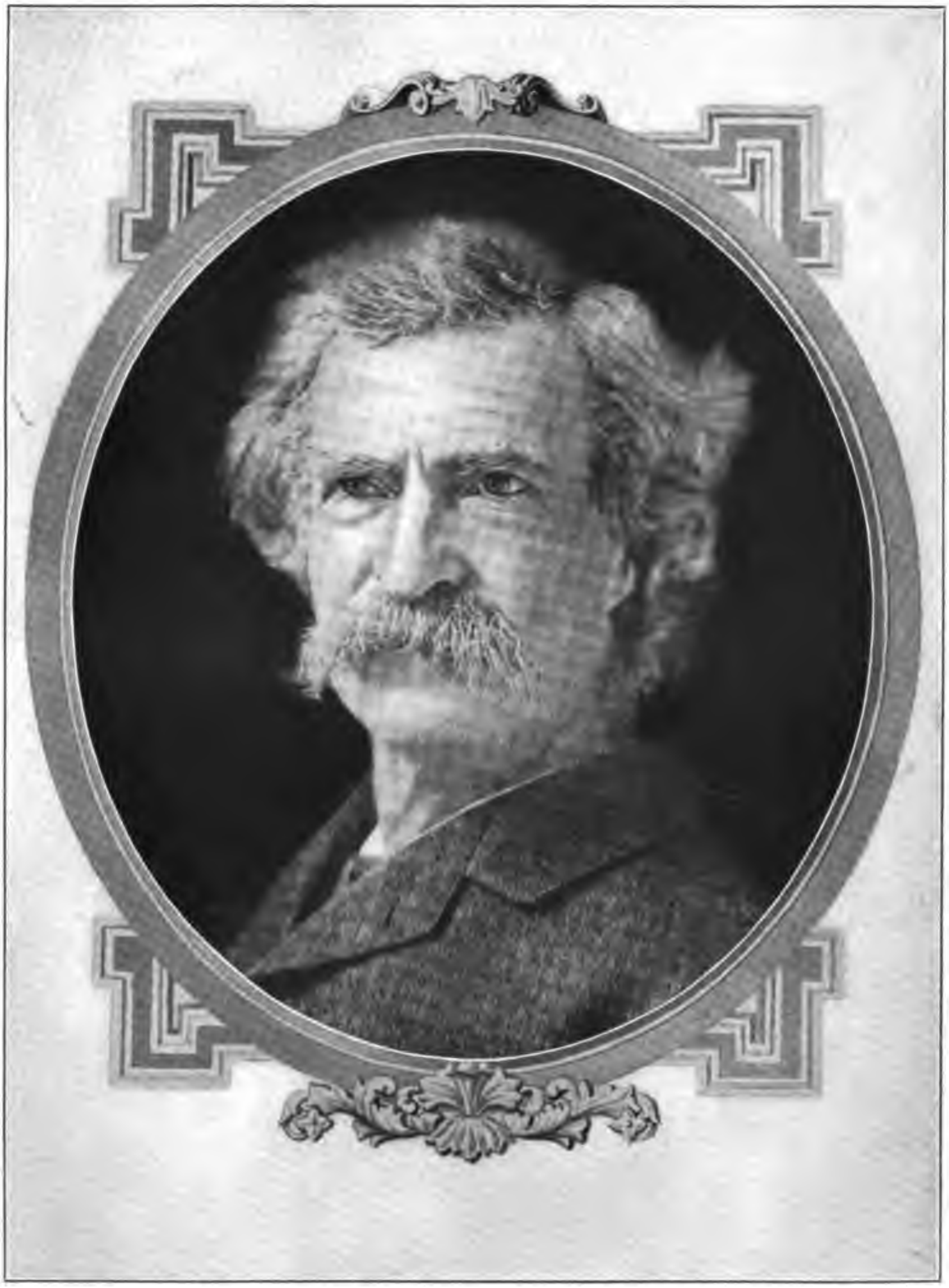
But Clemenceau's power was not broken. He kept his place in the Senate. In 1912 he overthrew Caillaux's Ministry. In 1913 he wrecked Briand's Cabinet on the issue of proportional representation. He started a new paper, *L'Homme Libre.* When the war began in 1914 he entered the Viviani Ministry. For some time he was chairman of the Parliamentary Committee on the Army.

His patriotism is well known, but he has never hesitated in the midst of the stress of war to argue, criticise and actually attack where he believed that a need for opposition existed. In September 1914, he published in his paper — which he had moved to Toulouse — a plea for preferential treatment for German prisoners from Alsace. For this his journal was ordered suspended for eight days. Clemenceau did not stop publication. He changed the name of his paper *L'Homme Libre* (The Free Man) to *L'Homme Enchaîné* (The Man in Chains). And its editor continued to criticise. The paper was temporarily suppressed several times.

In April of 1917 he was outspoken in his censure of the management of the allied offensive. He was somewhat scornful of America's long-continued neutrality, but was enthusiastic in his welcome when the United States entered the war. In the autumn of 1917 Clemenceau began the parliamentary attack against «Boloism» and on that issue the Painlevé Ministry fell in November. Clemenceau was summoned to the premiership and immediately set about forming his Cabinet. He has written plays, novels, philosophic essays and sociological studies, including 'De la génération des elements anatomiques'; 'La mêlée sociale' (1894); 'Le grand Pan' (1895); 'Les plus forts'; 'Le voile du bonheur'; 'Aux embuscades de la vie'; 'Les requins,' a play. See BOLO, PAUL; CAILLAUX, JOSEPH; FRANCE — HISTORY.

CLEMENS, Jeremiah, American politician: b. Huntsville, Ala., 28 Dec. 1814; d. there, 21 May 1865. He was graduated at the University of Alabama 1833, studied law at Transylvania University, Ky., and was admitted to the bar, 1834. He was United States attorney for the northern district of Alabama 1838; a member of the State legislature 1839–41, 1843–44; in 1842 raised a company of volunteer troops and went to Texas, having been appointed lieutenant-colonel, and subsequently held the same rank in the regular service. In 1848 he was governor of the civil and military department of purchase in Mexico, holding the position until the end of the war. He was a United States senator 1849–53, and held high rank as an able and eloquent debater. He took part in the Alabama secession convention, and though protesting against its action, subsequently yielded and held office under the Confederacy. In 1864 he advocated Lincoln's re-election. He wrote several novels which were popular in their day: 'Bernard Lyle' (1853); 'Mustang Gray' (1857); 'The Rivals: a Tale of the Times of Aaron Burr and Alexander Hamilton' (1859); 'Tobias Wilson' (1865), a story of the Confederacy. He left in manuscript an unfinished history of the war in northern Alabama.

CLEMENS, Samuel Langhorne, American humorist; more generally known by his pseudonym MARK TWAIN: b. Florida, Mo., 30 Nov. 1835; d. Redding, Conn., 21 April 1910. He received only a scanty school education, and in 1848 became apprentice to a printer, subsequently working at this trade in Philadelphia, New York and elsewhere. He afterward learned the business of pilot on the Mississippi, but left this occupation to become secretary to his brother, who had been appointed secretary of Nevada Territory. He then tried his fortune at the Nevada mines. In 1862 he became local editor of a newspaper in Virginia City, but soon went to San Francisco, where he was for some time a reporter. After meeting with slight success in the Calaveras gold-diggings he returned to journalism in San Francisco. In 1866 he went to the Sandwich Islands, and on his return commenced his lecturing career. A trip to the Mediterranean, Egypt and Palestine followed. He edited for a time a newspaper in Buffalo, and soon after married and settled in Hartford, Conn. He traveled widely, and many of the scenes and incidents in his works are drawn from his journeys. He lost heavily through the failure



SAMUEL LANGHORNE CLEMENS (" MARK TWAIN ")

of a publishing house which he founded in 1884. In 1905 a dinner was given him at New York by his author friends celebrating his seventieth birthday. When he visited England, in 1907, he was everywhere hailed with respect, and received from Oxford the honorary degree of Litt.D. His humor is characteristically American, but has a coarser side, often sinning against good taste and being irreverent and flippant at wrong times and places. But his comic force and fertility offset all defects; and beneath what seems reckless levity there is sound morality as well as clear-eyed shrewdness and hard common sense. The predilection which he vaunts for exploiting the mean aspect of things venerable or impressive betrays a touch of the spirit of American philistinism. Of this the 'Innocents Abroad' is an instance. But not so 'Huckleberry Finn' and 'Tom Sawyer'; in those, his best books, he appears as a master of humor and pathetic suggestion, and a truly creative genius. No other writer has so vividly portrayed the irrepressible American boy, or given his readers so adequate an impression of the large, homely, spontaneous life led by native Americans in the great valley of the Mississippi. Among his chief books are 'The Jumping Frog' (1867); 'The Innocents Abroad' (1869); 'Roughing it' (1873); 'The Gilded Age' (with Warner, 1873); 'Adventures of Tom Sawyer' (1876); 'A Tramp Abroad' (1880); 'Life on the Mississippi' (1883); 'Huckleberry Finn' (1885); 'A Yankee at the Court of King Arthur' (1889); 'The American Claimant' (1892); 'Tom Sawyer Abroad' (1894); 'Puddinhead Wilson' (1894); 'Joan of Arc' (1896); 'More Tramps Abroad' (1897); 'The Man That Corrupted Hadleyburg' (1900); 'Following the Equator' (1901); 'Christian Science' (1903); 'How to Tell a Story' (1904); 'Editorial Wild Oats' (1905); 'Eve's Diary' (1905); 'A Horse's Tale' (1906); 'The $30,000 Bequest' (1906); 'Autobiography of Mark Twain' (published serially). An edition of his collected writings, 'Writings of Mark Twain,' was published in 25 volumes (New York 1910). 'Mark Twain's Speeches,' edited by W. D. Howells, also was first published in New York in the year of the author's death. For biography, consult Paine, A. B., 'Mark Twain: A Biography' (New York 1912); for bibliography, see Johnson, M., 'Bibliography of Mark Twain' (New York 1910); other books connected with this author are Henderson, A., 'Mark Twain' (New York 1911); Sedgwick, H., «Mark Twain,» in the 'New American Type' (Boston 1908); Howells, W. D., 'My Mark Twain' (New York 1910); Macy, J., «Mark Twain,» in 'The Spirit of American Literature' (ib. 1913).

CLEMENS, Titus Flavius. See Clement of Alexandria.

CLEMENT I (Clemens Romanus), Pope and martyr and one of the apostolic fathers. By Irenæus he is reckoned the third in the line of the bishops of Rome, and Origen holds him to be the same Clement who is named by the Apostle Paul in his letter to the Philippians, iv 3. Tradition declares that he suffered martyrdom in the reign of Trajan and that his term of episcopate extended from 93 to 101; his day in the Roman calendar is 23 November. There is extant a letter from the Church of Rome to the Church of Corinth now generally accepted as having been written by this Clement. A bishop of Corinth, Dionysius, writing about 166 to a later Pope mentions Clemens Romanus as its writer. The letter was read as Scripture for a long time in public worship. Consult Lightfoot, J. B., 'The Apostolic Fathers' (part I); 'Saint Clement of Rome' (London 1890); Knopf, 'Der erste Clemensbrief' (Leipzig 1899); Gregg, 'The Epistle of Saint Clement, Bishop of Rome' (London 1899); Krüger, 'History of Early Christian Literature' (New York 1897); Harnack, 'Chronologie der altchristlichen Litteratur' (Leipzig 1897); Wrede, 'Untersuchungen zum ersten Clemensbrief' (Göttingen 1891).

CLEMENT II, Pope. He was a native of Saxony, Suidger by name, and was made pope by Emperor Henry III, whose chancellor he had been, in 1046 on the abdication of Gregory VI. He was the earliest of the six German pontiffs and a determined opponent of simony.

CLEMENT III, Pope: b. Rome; d. March 1191. He was a Roman by birth and cardinal bishop of Palestrina. He was elected Pope in 1187; preached the third crusade against the Saracens, made the Scottish Church directly dependent upon Rome rather than on York. There was an anti-pope with this title, who died in 1100.

CLEMENT IV (Gui Foulques, gē fook), Pope: b. Saint Gilles, France; d. Viterbo, 29 Nov. 1268. He was descended from a noble Provençal family. He served first as a soldier; later he became archbishop of Narbonne and cardinal bishop of Sabina. He became Pope in 1265, succeeding Urban IV, and was the friend and protector of Roger Bacon. He vigorously supported the claims of Charles of Anjou against Manfred, son of Frederick II, in the dispute concerning the two Sicilies.

CLEMENT V (Bertrand d'Agoust, bĕr-trän dä-goost), Pope: b. Bordeaux 1264; d. Roquemaure, Languedoc, 20 April 1314. He became Pope in 1305 and at the time of his election was archbishop of Bordeaux. He transferred his see from Rome to Avignon, and thus commenced «the Babylonish captivity» of the Church, which lasted about three-quarters of a century. Philip the Fair influenced him in his actions. Another memorable event of his reign was his bull suppressing the order of the Knights Templar, 1311. Consult Rabanis, 'Clement V et Philippe le Bel' (Paris 1858); Lacoste, 'Nouvelles études sur Clément V' (Bordeaux 1896).

CLEMENT VI (Pierre Roger, rō-zhā), Pope: b. near Limoges, France, 1292; d. Villeneuve d'Avignon December 1352. He succeeded Benedict XII in 1342. He refused to return to Rome from Avignon. The Emperor Louis of Bavaria was excommunicated and humiliated by him. In his capacity of ruler of the kingdom of Naples, he acquitted Queen Joanna of the murder of her husband, and by purchase secured possession of Avignon. He also resisted the advances of Edward III of England and made an attempt to bring about a reunion of the Latin and Greek churches.

CLEMENT VII (Giulio de Medici, mă'dē-chē), Pope: b. Florence about 1475; d. Rome September 1534. He succeeded Adrian VI 1523. His sympathies were at first with the Imperial party, but he found it expedient, after the success of Charles I at Pavia, to join the other Italian powers in a league with France. An attack from the Roman nobles again drove him to seek another alliance with the emperor. His vacillating conduct incurred the wrath of the Imperial party. The constable Bourbon, with the connivance of the emperor, invaded the papal territory with an army and sacked the holy city and held the Pope a prisoner for six months. After being released, he took refuge at Orvieto. Returning to Rome in 1529, he made peace with Charles, who promised to restore the Medici at Florence, and was crowned by the Pope in 1530. Clement urged the emperor to persecute the Lutherans in Germany, and evaded all demands for a general council. His refusal to sanction the divorce of Henry VIII created a breach with England; the weakness of his policy lost half of the German membership of the Church, and his rule was decidedly unsuccessful. The title of Clement VII was adopted also by the anti-pope Robert of Geneva 1378–94.

CLEMENT VIII (Ippolito Aldobrandini), Pope: b. Fano, Italy, 1536; d. 5 March 1605. He succeeded Innocent IX, 1592, reconciled Henry IV to the Church and ordered the execution of Giordano Bruno. He annexed Ferrara to the states of the Church. During the last years of his rule the controversy arose between the Jesuits and Dominicans on the question of grace, to settle which he established the Congregatio de Auxiliis Divinæ Gratiæ in 1597. He was a man of great sincerity and piety and an eminent scholar, as shown by his revised editions of the Vulgate, the breviary and the liturgical books. The anti-pope Clement VIII resigned, 1429, but did not close the western schism.

CLEMENT IX (Giulio Rospigliosi, rōs-pē-lē-ō'sē), Pope: b. Pistoia 1600; d. 9 Dec. 1669. He followed Alexander VII to the papal chair in 1667. In his pontificate was arranged the «Pax Clementina,» which for a time closed the Jansenist controversy.

CLEMENT X (Emilio Altieri, äl-tē-ā'rē), Pope: b. Rome, 13 July 1590; d. 22 July 1676. At nearly 80 he succeeded Clement IX and during his pontificate a notable controversy arose with Louis XIV relating to the enjoyment, during vacancy, of episcopal revenues and the right of filling such vacancies. Because of his age, much of the government was left in the hands of his nephew, Cardinal Paluzzo Paluzzi.

CLEMENT XI (Giovanni Francesco Albani, äl-bä'nē), Pope: b. Pesaro, Italy, 22 July 1649; d. 19 March 1721. He was elected successor of Innocent III in 1700, and in 1713 sent forth the celebrated bulls, 'Vineam Domini Sabaoth,' and 'Unigenitus' in condemnation of Quesnel's treatise on Grace and Predestination. The bull was opposed by the Jansenists, but approved by the Jesuits. The pretender in his efforts to obtain the English crown in 1715 was supported to some extent by Clement. Consult Lafiteau, 'Vie de Clément XI' (1752).

CLEMENT XII (Lorenzo Corsini, kôr-sē'nē), Pope: b. Florence 1652; d. 6 Feb. 1740. He was the successor of Benedict XIII in 1730, and was the first pontiff to oppose Freemasonry.

CLEMENT XIII (Carlo della Torre Rezzonico, kär'lō dĕl-lä tŏr'rä rĕt-sō-nē'kō), Pope: b. Venice March 1693; d. February 1769. He succeeded Benedict XIV in 1758. He supported the rights of the Church and did all in his power to protect it against the encroachments of the free-thinking groups which were gaining power in Portugal and France. He published a bull in behalf of the Jesuits after their expulsion from France and Spain in 1767.

CLEMENT XIV (Giovanni Vincenzo Antonio Ganganelli), Pope: b. San Arcangelo, near Rimini, Italy, 31 Oct. 1705; d. 22 Sept. 1774. He was a Franciscan friar, a man of great piety and worth; the friend and confidant of Benedict XIV. He was elected Pope in 1769 after a struggle in the conclave in which cardinals influenced by various of the Catholic powers made interest in favor of the suppression of the Society of Jesus. When the new Pope showed an unwillingness to do the will of the powers, the charge was made that he had received the support of many members of the conclave upon his promise to suppress the order; but this charge has been conclusively proved to be without foundation in fact; yet such was the urgency of the powers, he felt himself constrained in the interest of peace and of the Church to disband the Jesuit order, which he did in the apostolic brief *Dominus ac Redemptor* which declares the Society of Jesus dissolved forever. The fact that the brief had been drawn up and completed in November 1772 but was not published till July 1773 is proof that he was loath to publish so severe a decree against the order. After its issue he fell into a rapid decline, presumably from remorse, and though all his life he had been exceedingly vigorous, died little more than 12 months after the brief was published. It was this pontiff who founded the Clementine Museum in Rome. Consult Caraccioli, 'Vie de Clément XIV' (1775); Theiner, 'Geschichte des Pontificats Clements XIV' (1853); Von Reumont, 'Ganganelli (Papst Clement XIV), seine Briefe und seine Zeit' (Berlin 1847); Ravignan, 'Clément XIII et Clément XIV' (Paris 1854).

CLEMENT, kla-mäṅ', (Frédéric Jean) **Edmond**, French dramatic tenor: b. Paris, 1867. He received his education at the Institution Nôtre-Dame de Chartres and at the Paris Conservatory. His first appearance was in 'Mereille' at the Opéra Comique. He has sung in the leading cities of Europe and America. His most popular rôle is Don José in 'Carmen.' He created rôles in 'Benvenuto'; 'Falstaff'; 'Xavière'; 'L'Amour à la Bastille'; 'L'Ile du rêve'; 'Beaucoup de bruit pour rien'; 'Le Juif polonais'; and 'La petite maison.' He appeared also in 'La fille du régiment'; 'Fra Diavolo'; 'Don Juan'; 'L'Eclair'; 'Don Pasquale'; and 'Proserpine.'

CLEMENT, Ernest Wilson, American educator: b. Dubuque, Iowa, 21 Feb. 1860. He was graduated at the University of Chicago in 1880. He taught in secondary schools in 1880–87 and at the Mito High School, Japan, 1887–91. For the next three years he was teaching in the United States. In 1894 he became principal of the Duncan Academy, Tokio, retaining this post until 1911 when he was appointed teacher of the First High School, Tokio. In 1896–97 he was acting interpreter of the American legation at Tokio, and was librarian of the Asiatic Society of Japan in 1896–1900 and again after 1911. He was editor of the *Japanese Evangelist* 1899–1909 and of the *Christian Movement in Japan* 1907–09. He is a frequent contributor to American and Japanese periodicals. His published works include ‘Handbook of Modern Japan’ (1903); ‘Japanese Floral Calendar’ (1904); ‘Christianity in Modern Japan’ (1905); ‘Hildreth's Japan as It Was and Is’ (1906); ‘Japanese Chronology’ (1910); ‘Short History of Japan’ (1915).

CLEMENT OF ALEXANDRIA, Saint (Clemens Alexandrinus), Greek theologian, one of the most eminent and learned of the fathers of the Church. Very little, almost nothing, is known regarding his life. The first mention of him by a writer living in or near his time is made by Eusebius of Cæsarea and by Photius; they give his name as Flavius Titus Clemens, and later writers add to the name the designation Alexandrinus, “of Alexandria.” From his names and surname one might infer that he was of Latin race; but he wrote in Greek, and his writings do not indicate any special acquaintance with Roman life or thought. Whether he was a native of Alexandria or of some Grecian city cannot be decided. He was a convert from paganism and had an intimate acquaintance with the literature of Grecian philosophy, but of the circumstances of his conversion to Christianity, we know nothing. He was supposedly a disciple of Pantænus, director of the Catechetic school of Alexandria and became his successor, and had among his pupils Origen, who in turn succeeded him. Further, Clement was a priest of the church of Alexandria. The persecutions in the region of Septimius Severus drove him from Alexandria. He wandered to Palestine and Asia Minor, but there is no definite information as to the rest of his career. A list of his writings is given by Eusebius, Saint Jerome and Photius. It contains the titles of 10 separate works, namely: ‘Hortatory to the Greeks’; ‘The Tutor’; ‘The Stromates’ (usually called *Stromata*): this as its title indicates is a patchwork or collection of miscellaneous observations; ‘Who is the Rich Man that is Saved?’ These four works have come down to us complete or nearly so. The remaining six titles are works that have been lost: ‘Outlines’; ‘On the Passover’; ‘On Fasting’; ‘On Slander’; ‘Exhortation to Patience’; ‘The Church Rule.’ The ‘Hortatory to the Greeks’ exposes the absurdities and immoralities of the pagan religions; but the Grecian philosophers and poets had a notion of the true author of the universe. ‘The Tutor’ sets forth the rule of Christian living. ‘The Stromates’ is a miscellany but it consists of the author's own studies of questions and problems in philosophy, literature, history, etc., not of passages taken from other authors. The treatise on the “Rich Man” is a very judicious exposition of the passage in the Gospel of Mark x, 17–31. Consult editions by Potter (Oxford 1715) printed in Migne's ‘Patrologia Græcorum’ (Vols. VIII and IX, Paris 1857); Eng. trans. in ‘Ante-Nicene Fathers’ (Vol. II, ed. by A. C. Coxe, New York 1885). Consult also ‘Clement’ (in Smith and Wace, ‘Dictionary of Christian Biography,’ London 1877–87); Bigg, ‘The Christian Platonists of Alexandria’ (London 1899); de Faye, Eugène, ‘Clément d'Alexandrie’ (Paris 1898).

CLEMENTI, Muzio, klā-mĕn'tē, Italian pianist and composer: b. Rome 1752; d. Evesham, England, 10 March 1832. He studied under a relative, Buroni, and in 1761 became an organist. He studied counterpoint with Carpani and singing with Santarelli. As early as his 12th year he wrote a successful mass for four voices, and had made such progress in the pianoforte that an Englishman, Mr. Beckford, took him to England to complete his studies. He was then engaged as director of the orchestra of the opera in London, and his fame having rapidly increased, he went in 1780 to Paris, and in 1781 to Vienna, where he played in a contest with Mozart before the emperor. In 1784 he repeated his visit to Paris, but after that remained in England till 1802, when he went back to the Continent. He returned in 1810 to England, where he settled down as superintendent of one of the principal musical establishments in London, and after the failure of his concern formed a partnership with Collard. He was absorbed in the mechanical perfection of the piano and also with the writing of theoretical works. As a teacher he was unequaled. His most important compositions were his 60 sonatas for the pianoforte and the great collection of studies known as the ‘Gradus ad Parnassum,’ a work of high educative value. He represented perhaps the highest point of technique of his day, and his influence on modern execution has led to his being characterized as “the father of pianoforte playing.” Among his pupils are Field, Cramer, Moscheles, Kalkbrenner and Meyerbeer. He was interred in Westminster Abbey. Consult Ferris, ‘Great Violinists and Pianists’ (New York 1894); Shedlock, ‘The Pianoforte Sonata’ (London 1895); Frojo, ‘Muzio Clementi, la sua vita, le sue opere e la sua influenza sul progresso dell' arte’ (Milan 1878).

CLEMENTINES, so named after Pope Clement V, who during his pontificate (1305–14) had compiled the canons of the Church, chiefly out of the canons of the 15th Council of the Church, Vienne (1311). The Clementines are one of five great collections of Church laws, examined and decided upon according to the methods employed by ecclesiastical authority out of which the ‘Corpus Juris Ecclesiastici’ is made up. The Clementines constitute five books of this, and were edited and published by the Benedictines (9 vols. with appendix, 1885–92).

CLEMSON AGRICULTURAL COLLEGE, an educational (non-sectarian) institution in Clemson College Station, S. C.; organized in 1890; reported at the end of 1917: volumes in the library, 18,480; students, 819; professors, 65.

CLEOBIS, klē'ō-bĭs, **AND BITON**, bī'tŭn, two Grecian youths, the sons of Cydippe, chief priestess of Hera (Juno) at Argos. At the *Heraia*, a feast in honor of the goddess, it was customary for the chief priestess to be drawn by two white oxen. Herodotus relates that on one occasion the procession had already begun to move and the oxen had not arrived, upon which Cleobis and Biton drew the chariot of their mother for a distance of 45 stadia, up the mountain where the Temple of Hera stood. The people applauded, and the mother was so affected by this instance of filial affection that she begged the goddess to grant her sons the best gift which could be conferred on mortals. While the youths were yet in the temple a soft sleep fell upon them and they never awoke. The Argives placed the statues of Cleobis and Biton in the temple at Delphi, and in [illegible] temple at Argolis they were represented drawing a chariot of their mother. Consult Cicero, 'Tuscul' (Bk. I, 47); Stobæus, 'Sermones' (169).

CLEOBULUS, klē-ō-bū'lŭs, onc of the Seven Wise Men of Greece. He was a native and tyrant of Lindus, or according to some, of Caria, and flourished 560 B.C. He traveled to Egypt to learn wisdom, like many of the sages of Greece. He was king of Rhodes, and was succeeded on the throne by his daughter Cleobuline, whose riddles are not less famous than his own. He was the first to give literary form to riddles. Diogenes Laërtius has preserved several of his riddles. Consult Diogenes Laërtius (I, 89–93); Mullach, F. G., 'Fragmenta Philosophorum Graecorum' (Bk. I).

CLEOMBROTUS, klē-ŏm'brō-tŭs, an ancient Greek military leader, son of Pausanias, king of Sparta, succeeding his brother Agesipolis I. During his reign began the Theban War, in which he commanded the Spartans against Epaminondas and Pelopidas. He was killed in the battle of Leuctra, which happened 8 July 371 B.C., according to the Julian calendar. See EPAMINONDAS.

CLEOME, klē-ō'mē, a genus of plants, herbs and shrubs of the caper family (*Capparidaceæ*), comprising about 75 species, natives of tropical regions. Less than 10 species are found in the United States, most of them adventitious additions from South America, escaped from gardens. The native varieties belong to the Rocky Mountain region, and when found to westward are naturalized specimens. Pink cleome or Rocky Mountain bee plant (*C. serrulata*) has a stem from two to three feet in height, the pinkish-white flowers very showy and attractive. Its native habitat is the Rocky Mountain region from Canada to Arizona and Mexico, but it extends eastward to Lake Michigan. The spider flower (*C. spinosa*) of the eastern seaboard, from New Jersey to Florida, is a South American species escaped from culture.

CLEOMEDES, klē-ō-mē'dēz, ancient Greek author. He wrote a treatise, in two books, 'On the Circular Theory of the Heavenly Bodies,' which sets forth the Stoic theory of the universe, and which is remarkable as containing, amid much error and ignorance, several truths of modern science — such as the spherical shape of the earth. Nothing is known definitely regarding his life, but it seems most probable that he flourished in the 2d century A.D. Ziegler's edition of his work (1891) is probably the best.

CLEOMENES, klē-ŏm'ē-nēz, the name of three kings of Sparta, of the Agiad line: (1) Cleomenes I, the son of Anaxandridas, whom he succeeded about 520 B.C. His chief exploit was the crushing victory near Tiryns over the Argives. (2) Cleomenes II, the brother and successor of Cleombrotus I. There is no record of his reign, except that it lasted from 327–309 B.C. (3) Cleomenes III, king from 236 to 220 B.C. He was the son of Leonidas II and the last of the Agidæ. He distinguished himself in a war against the Achæans. Returning to Sparta he put to death the ephori, made a new division of lands, introduced again the old Spartan system of education and bestowed the full franchise upon many who had not before had it. He lived very simply, was just and friendly and treated his enemies with generosity. He showed himself an able general in a war against the Macedonians and Achæans united, but at last lost the important battle of Sellasia (222 B.C.). He fled to Egypt, where he attempted to raise an insurrection, but finding no supporters committed suicide. He was one of Sparta's best and ablest men, and with him perished the hope of Spartan supremacy. Consult Plutarch, 'Cleomenes, Aratus' (34–46); Philopœmem (5–6); Polybius (II, 45–70; V, 35–39; VIII); Holm, 'History of Greece,' (Vol. IV, cc. 10, 15).

CLEOMENES, or THE SPARTAN HERO, a play by Dryden and Southerne, acted in 1692.

CLEON, klē'ŏn, Athenian demagogue, killed at Amphipolis, Macedon, 422 B.C. He was the son of Cleænetus and was a tanner by trade, but became well known in public affairs before the death of Pericles. By the year 427 he was high in favor with the people and distinguished himself by the atrocious proposal that all the adult males of the revolted Mytileneans should be put to death and the women and children sold for slaves. In 425 he took prisoners those Spartans who had been blockaded by an Athenian force in the island of Sphacteria. The next year Aristophanes attacked him in his comedy of the 'Knights' — as he did also in the 'Wasps' in 422 — satirizing his venality, rapacity, ignorance, violence and cowardice. The portrait was probably correct in the main. In 422 he was sent to Chalcidice against Brasidas, who was capturing the Athenian tributary cities there. He was taken unawares by a sally of Brasidas and was slain at Amphipolis. His death paved the way for the peace of Nicias in 421. Consult Grote, 'History of Greece' (Vol. VI, London 1888); Beloch, 'Die attische Politik seit Perikles' (Leipzig 1884); Holm, 'History of Greece' (Eng. trans., Vol. II, Chap. 23, New York 1902).

CLEOPATRA, klē-ō-pā'trą, the name of several Egyptian princesses, of whom the most renowned was the eldest daughter of Ptolemy Auletes: b. 69 or 68 B.C.; d. 30 B.C. With her eldest brother Ptolemy she shared the throne of Egypt. Both were minors at the death of their father, and were placed under the guardianship of Pothinus and Achillas, who deprived Cleopatra of her share in the government 49 B.C. She went to Syria, and was forming plans for obtaining her rights by force, when Cæsar came to Alexandria, and, captivated with her charms, successfully seconded her claims. Pothinus stirred up a second revolt, upon which the Alexandrian War commenced, in which the elder Ptolemy lost his life. Cæsar proclaimed Cleopatra queen of Egypt; but she was compelled to take her brother, the younger Ptolemy, who was only 11 years old, as her nominal husband and colleague on the throne. The Queen subsequently made a journey to Rome, where Cæsar received her magnificently, and erected a statue to her next to the statue of Venus, in the temple consecrated to that diety. Cleopatra remained in Rome from 46 B.C. to 44 B.C., returning to Egypt after Cæsar's death. She had by Cæsar a son, Cæsarion, afterward put to death by Octavius. When her brother, at the age of 14, demanded his share in the government Cleopatra poisoned him, and remained sole possessor of the regal power. During the civil war in Rome she declined to take sides with either party, but after the battle of Philippi she sailed to join Antony at Tarsus. She was then 25 years old, and combined with extraordinary beauty, great wit and the highest elegance of manners. She appeared in a magnificently decorated ship, under a golden canopy, arrayed as the goddess Aphrodite, surrounded by beautiful boys and girls who represented Cupids and Graces. Her meeting with Antony was attended by the most splendid festivals. After having accompanied him to Tyre she returned to Egypt. Antony followed her, and gave himself up to the most extravagant pleasures. She accompanied him on his march against the Parthians, and when he parted from her on the Euphrates he bestowed Cyrene, Cyprus, Cœlosyria, Phœnicia, Cilicia and Crete on her, to which he added part of Judea and Arabia at her request. On her account, or as an expression of hostility to Octavius, who declared war against Egypt in 32 B.C., he divorced his wife Octavia and made his three sons by Cleopatra, and also Cæsarion, kings. Instead of acting promptly against his adversary, Antony lost a whole year in festivals and amusements with Cleopatra at Ephesus, Samos and Athens, and at last determined to decide the contest by a naval battle. At Actium the fleets met. Cleopatra, who had brought Antony a reinforcement of 60 vessels, suddenly took to flight, and thus caused the defeat of her party; for Antony, as if under the influence of frenzy, immediately followed her. They fled to Egypt, and declared to Octavius that if Egypt were left to Cleopatra's children they would thenceforth live in retirement, but Octavius demanded Antony's death, and advanced toward Alexandria, which Antony hastened to defend. Cleopatra determined to burn herself with all her treasures but Octavius pacified her by private messages. These communications, however, did not remained concealed from Antony, who, supposing Cleopatra treacherous, hastened to her, to avenge himself by her death. She, however, escaped and took refuge in the mausoleum which she had erected near the Temple of Isis, and caused the report of her suicide to be circulated. Antony now threw himself upon his sword; but before he expired was informed that Cleopatra was still living, upon which he caused himself to be carried into her presence, and breathed his last in her arms. Octavius succeeded in getting Cleopatra into his power. She still hoped to subdue him by her charms, but her arts were unavailing, and becoming aware that her life was spared only that she might grace the conqueror's triumph, she determined to escape this ignominy by a voluntary death. According to the generally received account of her death she ordered a splendid feast to be prepared, desired her attendants to leave her, and put an asp, which a faithful servant had brought her, concealed amongst flowers, on her arm, the bite of which caused her death almost immediately. There is, however, some doubt as to the exact method by which she took her life. Her body was interred near that of Antony. At the time of her death she had reigned 21 years. Her daughter by Antony married the king of Mauretania; their son, Ptolemy, last of the line, was slain by Caligula in 40 A.D.

CLEOPATRA'S NEEDLES, two obelisks, formerly at Alexandria, one of which is now in New York, the other in London. They are made of red syenite, quarried at the First Cataract, and were originally erected by Thothmes III in the 40th year of his reign (about 1,460 B.C.) in front of the portico of the great temple of Heliopolis, the On of the Scriptures, and the place where Moses was born and brought up. From Heliopolis the two obelisks were removed to Alexandria in 13–12 B.C., as shown by inscriptions on the claw of one of the bronze crabs placed by the Romans under the corners of the obelisk when they set it up in Alexandria nearly 17 years after the death of Cleopatra. How, then, they came to be called Cleopatra's Needles is not apparent; but it may be conjectured that they had been removed by her order some time before they were set up on their second site, or that their removal was the carrying out of an intention formed by Cleopatra. Mr. (after Sir) Erasmus Wilson, to whom the credit may be awarded of having been chiefly instrumental in getting the British obelisk conveyed to London, assumes that the association of Cleopatra's name with the two obelisks represents the popularity of the queen and the affectionate regard of her subjects, rather than any participation of herself in their transport or erection. The obelisk now at London lay for a long time prostrate in the sand. In 1820 it was presented by Mehemet Ali to the British nation, but the British government never did anything for its removal, which was at last effected solely through the public spirit of several private individuals, the obelisk being erected on the Thames embankment in 1878. The other obelisk was presented to the United States by the Khedive of Egypt, and its transportation to its present position in Central Park, New York, where it was erected in 1881, was made possible by the liberality of W. H. Vanderbilt. It stands upon four bronze crabs, reproductions of the original crabs upon which the obelisk formerly stood. Two of the originals are now in the Metropolitan Museum, New York. The "needle" in London is somewhat the taller of the two, being 68 feet 5½ inches in height, as against 67 feet 2 inches, the height of the other. The lateral measurements at the base are, in the British obelisk, 7 feet 5 inches in one pair of opposite sides and 7 feet 10½ inches in the other pair; in the one in New York, 7 feet 9¾ inches, and 8 feet 2¼ inches. The weight of the British obelisk is rather more than 186 tons, and its mass 2,529 cubic feet. Both obelisks are inscribed with hieroglyphs, engraved to a depth of several inches and carefully polished. The hieroglyphs are inscribed in vertical columns, which are read from the top downward; and in each case the middle column is in honor of Thothmes, by whom the obelisks were first erected, and the side columns in honor of Rameses II.

CLEPSYDRA, klĕp-sĭ'dra, or **WATER-CLOCK,** an instrument for the measurement of time by the escape of water from a vessel through an orifice. Its origin is extremely ancient, and has generally been attributed to the Egyptians. Two descriptions of clepsydræ have been employed — one in which the water merely escapes through the orifice, the other in which the same level is constantly maintained by the introduction of a fresh supply of water, and a uniformity of efflux secured by retaining throughout an equal amount of pressure on the fluid as it issues from the bottom of the vessel. In one kind of water-clock the measure of time is registered on a dial-plate by means of a hydraulic apparatus acted on by the efflux of water from a cistern. The simpler form was used in Athenian courts where a speaker was allowed so much water for his speech, according to the importance of his case. The more complicated form is said to have been invented by Plato; or by Ctesibius, according to some. Both forms were introduced into Rome in 159 B.C. These instruments are now scarcely ever constructed.

CLERC, Laurent, klăr, French deaf mute: b. La Balme, Isère, France, 26 Dec. 1785; d. Hartford, Conn., 18 July 1869. At the age of 12 years his uncle took him to Paris, and placed him in the institution for the deaf and dumb. He became the favorite pupil of the Abbé Sicard. His intellectual condition, like that of most of the uninstructed deaf mutes, was at this time deplorable. «I had,» he says, «a mind, but it did not think; I had a heart, but it did not feel. My mother had endeavored to show me the heavens, and make me know God, but her attempts were vain; I could comprehend nothing. I believed that God was a tall, big, and strong man, and that Jesus Christ, having come to kill us, had been killed by us, and placed on a cross as one of our triumphs.» Under the skilful instruction of the Abbé Sicard he made rapid proficiency, and in 1805, after passing eight years in the institution, he was appointed tutor, and in 1806 a salaried teacher. In 1816 Clerc formed the acquaintance of Gallaudet (q.v.), who persuaded him to accompany him to this country, here to lay the foundation of deaf mute instruction. (See DEAF MUTES). They succeeded in establishing an institution, since known as the American Asylum for the Deaf and Dumb, at Hartford. On 15 April 1817 the asylum was opened with seven pupils, and Messrs. Gallaudet and Clerc installed as teachers. The greater part of the teachers sent to other institutions for the deaf and dumb from this mother asylum received their training at his hands. He married a deaf mute, but his children could both hear and speak.

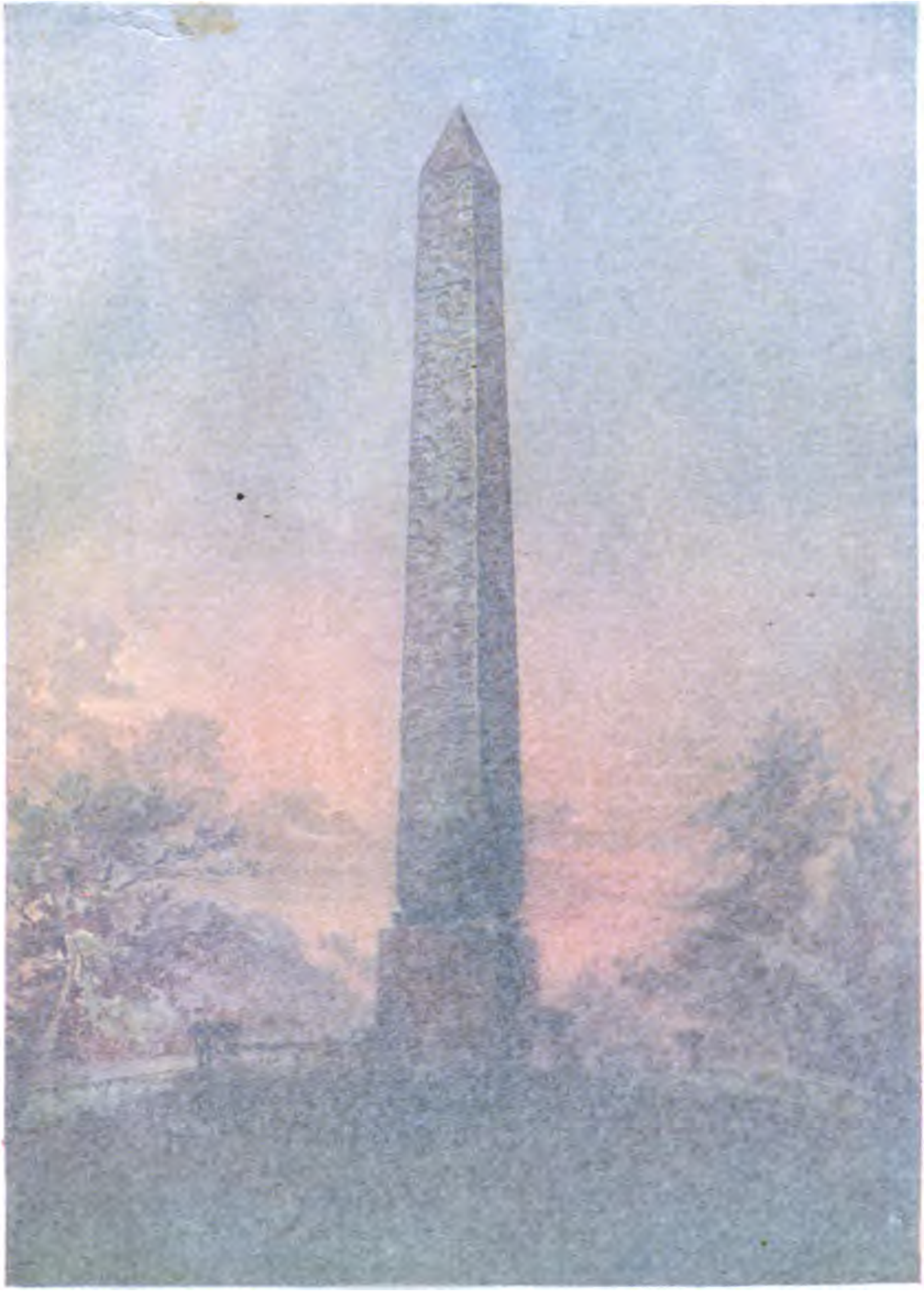
CLERESTORY, or **CLEARSTORY,** the upper part of the nave in churches, above the triforium where a triforium is present, and formed by walls supported on the arches of the nave, and rising above the roof of the side aisles. In these walls windows are inserted for the purpose of increasing the light in the nave. The earliest known is that of the Hypostle Hall at Karnak. The Romans used the device in their lofty bath halls; the same arrangement is seen in the basilica of Maxentius and in modern halls of the same type, e.g., the Pennsylvania Railway Station in New York. The clerestory was an essential feature of the Christian basilicas; occurs also in Hagia Sophia and the Byzantine churches. In Norman architecture the three stories of pier arcade, triforium and clerestory are of nearly equal height, but in Gothic the clerestory becomes relatively of greater significance and in late Gothic work is often very lofty.

CLERGY (Lat. *clericus*, from Gk. κλῆρος, a lot), in the Christian Church, that portion of the faithful which is set apart for the ministry of religion. The separation from the laity became more marked through the multiplication of offices and titles, privileges, rights, peculiar dress and habits. In the Roman Catholic Church there are eight grades or distinctions of clergy, namely, that of the simple cleric, those of the four minor orders and those of the three sacred orders of subdeacon, deacon and priest (qq.v.). The last three are regarded as being of divine institution. The simple cleric is one who has received the ecclesiastical tonsure; by that rite he is made a clerk or cleric, and as such is entitled to certain rights, privileges and immunities and assumes certain obligations not incumbent on the laity. In Protestant churches the distinction between clergy and laity is much less wide. See HOLY ORDERS.

CLERK, formerly the name given to an ecclesiastic. Since learning of all kinds at first centred in the Church, the name was assumed by all men of learning, whether belonging to Church or laity. At present the term designates one who has charge of an office or department, subject to a higher authority, as a board, corporation, etc.; a secretary, as the clerk of the House of Representatives or Senate, clerks of the various courts, etc. In England a parish officer, a layman, whose business used to be to lead the responses in the church services and to perform other duties connected with the parish; a parish clerk. The mediæval use of the terms «clerk in holy orders» and «clerk in minor orders» still exists to distinguish the various ministers of the Established Church.

CLERK-MAXWELL, James. See MAXWELL.

CLERKE, Agnes Mary, Irish astronomer: b. Skibbereen, Ireland, 10 Feb. 1842; d. London, 20 Jan. 1907. She gave her life to astronomical research, was awarded the Actonian prize and became a member of the British Astronomical Association. She was also honorary member of the Royal Astronomical Society. She published 'A Popular History of Astronomy in the Nineteenth Century' (1885; rev. ed., 1902); 'System of the Stars' (2d ed., 1905); 'The Herschels and Modern Astronomy' (1895); 'Problems in Astrophysics' (1903); 'Modern Cosmogonies' (1906); 'The Concise Knowledge of Astronomy' (with J. E. Gore and A. Fowler, 1898). She contributed to the 'Catholic Encyclopedia,' the 'Dictionary of



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C[illegible] Agnes Mary, [illegible] Ireland, [illegible] of the [illegible] also honorary [illegible] Astronomical Society [illegible]

CLEOPATRA'S NEEDLE, CENTRAL PARK, NEW YORK

National Biography' and the 'Encyclopædia Britannica.' She also wrote for the *Edinburgh Review*, the *Tablet*, *Knowledge*, etc.

CLERKENWELL, England, parish of London north of Saint Paul's Cathedral and within the metropolitan borough of Finsbury. It is inhabited by the better class of workingmen in the metal trades, being noted for its output of watches, optical instruments and articles of gold and silver. Technical education is provided in these trades by the Northampton Polytechnic Institute. The name comes from the well around which the parish clerks of London used to meet. An attempt by Fenians to destroy the Clerkenwell prison was made on 13 Dec. 1867. Pop. 57,121.

CLERMONT, The, the name given by Robert Fulton (q.v.) to the steamboat in which he made his first trip from New York to Albany, 11 Aug. 1807. The speed attained was only five miles per hour.

CLERMONT-FERRAND, klār-môṅ-fĕr-rāṅ, France, town in the department of Puy-de-Dôme, of which it is the capital, 113 miles west of Lyons. It is situated on a hill at the foot of the volcanic range in which the summit of the Puy is conspicuous. It was originally the capital of the Arverni, possessed considerable importance under the Romans and became a bishop's see in 250. It was afterward sacked by the northern hordes, but soon recovered, and was selected in 1095 for the meeting of the great council in which the crusades originated. In 1556 it became the capital of the duchy of Auvergne. Among its natives are Gregory of Tours, Pascal and General Dessaix. The most remarkable edifices are the Gothic cathedral, a huge, irregular, gloomy pile, begun in 1248, and recently completed by the construction of the west front and two towers; the church of Nôtre Dame, founded in 580, and encrusted externally with rude mosaics; the townhouse, courthouse, theatre, general hospital, etc. There are also a medical and a theological college, technical schools, observatory, library containing about 125,000 works, botanic garden and museums of natural history and antiques. It is the centre of a great rubber industry. Other manufactures consist chiefly of chemicals, animal oils, table-linen, nails, hats, machinery, etc. It is an important centre of trade. Near it there are two mineral springs. Pop. of commune (1911) 65,386.

CLERMONT-TONNERRE, tō-nār, the name of a distinguished ancient family of counts in Dauphiny. One of the most celebrated is Stanislas Marie Adelaide, Count de: b. 1757; d. 1792. At the breaking out of the Revolution in 1789 he took his place in the States-General as deputy of the nobility. He maintained the doctrine of a constitutional monarchy and incurred the displeasure of both the Aristocratic and Republican parties. As a counterpoise to the influence of the Jacobins, he, in concert with Malouet and other friends of monarchy, founded the Monarchical Club; and with Fontanes started the *Journal des Impartiaux*. The club having been denounced by Barnave as a band of conspirators, was dissolved, and the journal was suppressed after an existence of only two months. In 1791 he was arrested on the charge of having aided the king in his attempt to escape, but regained his liberty on taking an oath of fidelity to the National Assembly. The next year he was dragged by a mob before the section. As no sufficient ground of detention appeared he was dismissed, but was pursued and murdered. His collected speeches were published under the title 'Recueil des opinions' (Paris 1791). Aimé Marie Gaspard, Marquis, afterward Duke de: b. Paris 1779; d. 1865. After receiving education at the École Polytechnique he entered the army, served in Italy, Germany and Spain and became aide-de-camp to Joseph, king of Spain. After the restoration of Louis XVIII he was Minister of Marine and in 1823–27 Minister of War. The revolution of July was distasteful to him and he retired from political life.

CLÉRON, Joseph Othenin Bernard de (Comte d'Haussonville), French statesman and writer: b. Paris 1809; d. 1884. He entered the diplomatic service and was successively secretary of embassy at Brussels, Turin and Naples. In 1842–48 he was member of the Chambre des Deputés, sitting for Provins. Being a Conservative, the revolution of 1848 caused his retirement from politics and thereafter he gave his attention to literature. In 1869 he was elected member of the French Academy and in 1878 he was named Senateur perpetuel. He was active in behalf of the Alsatian exiles after the war with Prussia in 1870. His works include 'Histoire de la politique extérieure du governement français de 1830 à 1848' (1850); 'Histoire de la réunion de la Lorraine à la France' (1854–59); 'L'Eglise romaine et le premier empire' (1864–69). During the war of 1870–71 he published several pamphlets and political letters which exerted considerable influence throughout France; of these the most widely circulated was 'La France et la Prusse devant l'Europe.'

CLÉRY, klā-rē, **Jean Baptiste,** the valet de chambre of Louis XVI: b. near Versailles, 11 May 1759; d. near Vienna, 27 May 1809. When in 1792 the royal family of France were imprisoned in the Temple, Cléry was one of the few servants permitted to accompany them. Louis XVI, a few days before his death, divided a loaf of bread with this faithful companion of his misfortune, the only proof of his regard which he was able to show him. After the king's death, Cléry was devoted to the Dauphin. He wrote a journal of what passed in the Temple from the captivity of Louis XVI until the death of the Dauphin; it has been several times republished.

CLÉSINGER, klā-zăṅ-zhā, **Jean Baptiste Auguste,** French sculptor: b. Besançon, 22 Oct. 1814; d. Paris, 7 Jan. 1883. He obtained considerable reputation for busts of distinguished persons, and also executed statues and historical groups. His colossal bust of 'Liberty,' and his statues of 'Fraternity,' 'Woman Bitten by a Serpent,' 'The Gipsy Girl' and of Rachael and Cruvelli in some of their principal parts are among his best known works. Others are 'Phryne'; 'Louise of Savoy,' in the Luxembourg Gardens; and the statue of 'Music,' on Chopin's grave. His work is of masterly technique, but lacks depth. He was commissioned by the French government to execute an equestrian statue of Francis I. He married a daughter of Madame Dudevant (George Sand).

CLESSE, klĕs'ē, **Antoine,** Belgian popular poet: b. The Hague 1816; d. Mons 1889. To the day of his death he followed his trade of armorer. His first ballad, ‘Godfrey de Bouillon,’ won for him a gold medal. His popular songs ‘Beer’ and ‘The Family Name’ (meaning Belgian, including Fleming, Walloon, etc.) came into great favor with the people. He wrote also a comedy, ‘A Poet.’ Two volumes of ‘Songs’ (1866–88) contain all his popular ballads, with the music. They were published at Mons (1886). Consult Potvin, ‘Histoire des lettres en Belgique’ (Brussels 1882).

CLETHRA, klĕth'rạ, the typical genus of the family *Clethraceæ,* or white-alder family. The family has but this single genus, which numbers about 30 species, indigenous to Japan, Madeira, Mexico, South America and the eastern seaboard of North America. The United States species are the sweet-pepperbush or white-alder (*C. alnifolia*), found near the coast from Florida to Maine, and the mountain sweet-pepperbush (*C. acuminata*), a shrub or small tree growing in the mountain woods of Virginia, the Carolinas and Georgia.

CLEVEDON, England, watering-place on the Bristol Channel, about 15 miles southwest of Bristol. It is the burial-place of Hallam, the historian, and of his son Arthur, whom Tennyson's ‘In Memoriam’ has made famous. Here Coleridge lived in 1795. Clevedon Court is the Castlewood of Thackeray's ‘Henry Esmond.’ Pop. 6,111.

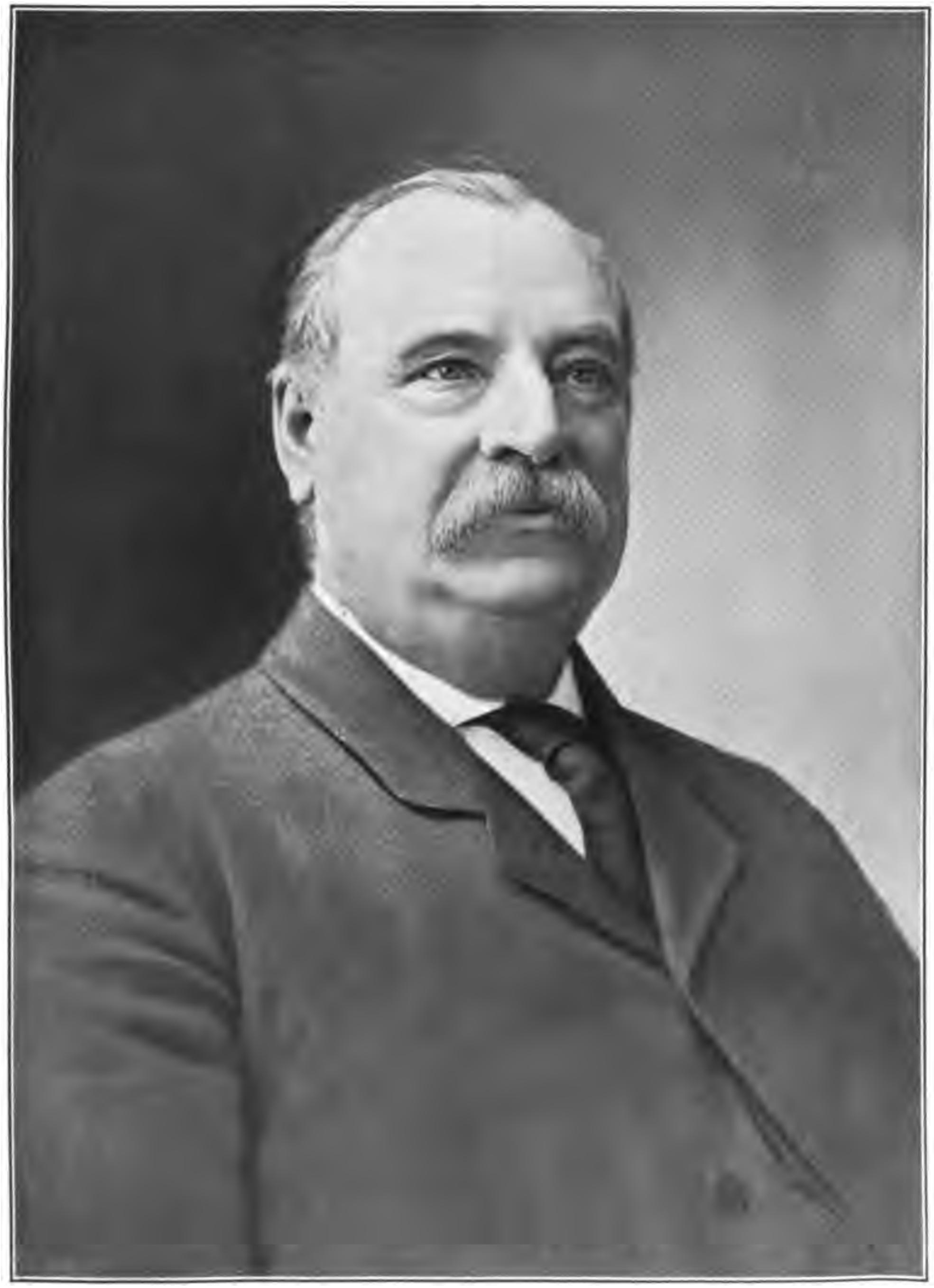
CLEVELAND, Charles Dexter, American author: b. Massachusetts 1802; d. 1869. He was graduated at Dartmouth in 1827 and became professor of Latin and Greek in Dickinson College, and of Latin in the University of the City of New York. He was United States consul at Cardiff, Wales, 1861–67. His chief works include an edition of ‘Milton's Poetical Works’ with a ‘Life’ (1851); ‘A Complete Concordance to the Poetical Works of John Milton’ (1867); ‘English Literature in the Nineteenth Century’ (1851); and compendiums of ‘English Literature’ (1847); ‘American Literature’ (1858); ‘Classical Literature’ (1861).

CLEVELAND, Chauncey F., American lawyer and politician: b. Hampton, Conn., 16 Feb. 1799; d. there, 6 June 1887. He was admitted to the bar in 1819, became active in local politics as a Democrat, and in 1826 was elected to the State legislature, serving 12 terms in all; and was speaker of the lower house in 1836, 1838 and 1863. He was appointed attorney-general of Connecticut in 1832; and was elected governor in 1842 and 1843; in both years the popular vote was indecisive and he was chosen by the legislature. In 1849 and 1851 he was elected to Congress. He was one of the leaders in the organization of the Republican party; in 1860 was a presidential elector; and in 1861 was a delegate to the Peace Congress.

CLEVELAND, Frederick Albert, American economist: b. Sterling, Ill., 17 March 1865; d. 15 Oct. 1914. He was graduated at De Pauw University in 1890. He studied for the bar, but gave up practice in 1896 and thereafter gave his entire attention to economics, first at the University of Chicago and then at the University of Pennsylvania. He was instructor in finance at the latter institution in 1900–03, and from 1903 to 1905 was professor of finance at the School of Commerce, New York University. He served as accounting expert on several commissions, including that on the finances of New York city (1905) and President Taft's commission on economy and efficiency (1911) which recommended a national budget. He was appointed director of the bureau of municipal research in 1907. His publications include ‘Growth of Democracy in the United States’ (1898); ‘Funds and their Uses’ (1902), school edition as ‘First Lessons in Finance’ (1903); ‘The Bank and the Treasury’ (1905); ‘Chapters on Municipal Administration and Accounting’ (1909); ‘Organized Democracy’ (1913); ‘Railroad Capitalization and Promotion,’ with F. W. Powell (1908); ‘Railroad Finance,’ with F. W. Powell (1912).

CLEVELAND, John, English poet and satirist: b. Loughborough, June 1613; d. London, 29 April 1658. He studied at Christ College, Cambridge, where Milton was a fellow-student; became a fellow of Saint John's College 1634; and M.A. 1635. A royalist and gifted satirist, he was judge-advocate at Newark 1645–46, but after its capitulation underwent a series of vicissitudes and wanderings until his death. Among his contemporaries, Cleveland's poems were held in higher esteem than Milton's; ‘The Rebel Scot’; ‘Rupertismus’; ‘Smectymnuus, or the Club Divines’; ‘Fuscara, or the Bee Errant’; and three elegies on the king, are the most noteworthy. Consult Berdan, J. M., ‘The Poems of John Cleveland’ (New York 1903).

CLEVELAND, (Stephen) Grover, 22d President of the United States: b. Caldwell, N. J., 18 March 1837; d. Princeton, N. J., 24 June 1908. Grover was the fifth of a family of nine children born to Rev. Richard F. Cleveland, a graduate of Yale (1824) and Presbyterian clergyman, and Ann Neal, the daughter of a Baltimore merchant of Irish descent. He received a common school and academic education at Fayetteville and Clinton, N. Y., the successive residences of the family after leaving Caldwell, and was preparing for college when his father's sudden death (1853) changed his prospects entirely. To support himself and to aid in providing for the rest of the family he secured a clerical position in the New York Institution for the Blind, where his older brother William was a teacher. In 1855 he started West, but on his way stopped at Buffalo to visit an uncle, Lewis F. Allen, a stock breeder and publisher of ‘The Herd-Book of American Short-Horn Cattle.’ His uncle advised him to stay in Buffalo and employed him in the preparation of the ‘Herd-Book,’ until a position as clerk and copyist was secured in a law office, August 1855. He at once set to work with perseverance and industry to make himself useful and master the rudiments of the law, with the result that in 1859 he was made managing clerk of the firm at a salary of $600 (increased to $1,000 in 1863) and admitted to the bar. During the war, his two brothers being in the Union army, the support of his mother and sisters fell upon him. Unable to



GROVER CLEVELAND

Twenty-second and Twenty-fourth President of the United States

enlist, he borrowed money to pay for a substitute. In 1863 he was appointed assistant district attorney of Erie County, serving with zeal and energy. He attended every one of the 12 grand juries which met during each of the three years of his term and presented in full a majority of the cases. As the Democratic candidate for district attorney in 1865 he was defeated by his friend Lyman K. Bass. In 1869 he became a member of the law firm of Lanning, Cleveland and Folsom. Elected sheriff of Erie County (1870), he performed his duties faithfully and used his leisure in prosecuting further professional studies. At the end of his term (1873), he joined the firm of Bass, Cleveland and Bissell, acquired increasing success in practice and took a still higher position at the bar. In 1881 the citizens of Buffalo determined to check the flagrant corruption in the city government. Cleveland was elected mayor on the Democratic ticket by a majority of 3,500 though the Republican State ticket received an average majority there of 1,600. As mayor, he displayed a thorough knowledge of the laws and a clear perception of the needs and rights of the city. He insisted upon placing public interests above party claims; saved the city over $1,000,000 by preventing corrupt schemes and bargains; and won the gratitude of people and press irrespective of party. On 22 Sept. 1882 he was nominated for governor against the Republican candidate, Charles J. Folger, and elected by the unprecedented majority of over 192,000 votes. As governor he conducted a thoroughly business-like administration, making frequent use of his veto power, but his vetoes were always clearly in accord with his duty under the law. His record as mayor and governor won for him the Democratic nomination for President, 10 July 1884. The ensuing campaign was unusually bitter. Its broad distinguishing feature was the rise in the Republican party of the independent or «mugwump» movement supporting Cleveland. During the contest, discussion of the record in Congress of James G. Blaine, his Republican opponent, was met by virulent counter attacks upon Cleveland's personal character. At the election Cleveland received 219 electoral votes to 182 cast for Blaine, and was inaugurated President 4 March 1885, having resigned his governorship on 6 January. Only the briefest mention can indicate the important and difficult questions that marked his administrations. His first message recommended a reduction of the tariff, the extension of civil service reform, regulation of the presidential succession and the settlement of the fisheries dispute with Great Britain. His removals from non-political offices were less sweeping than those of any President since Jackson; of 987 bills passed by Congress up to 5 Aug. 1886 he vetoed 102, chiefly private pension bills; he won a sharp contest with the Senate over suspensions and nominations; and devoted his 1887 message entirely to the existing tariff, denouncing it as vicious and unnecessary and demanding the abolition of duties on raw materials. Defeated for re-election in 1888, he retired to the practice of law in New York city (1889–93). Re-elected in 1892, he took office in 1893 in the midst of threatening currency and financial conditions. His inaugural declared that «so far as the executive branch of the government can intervene, none of the powers with which it is invested will be withheld when their exercise is deemed necessary to maintain our national credit or avert financial disaster.» Accordingly he forced the repeal of the Sherman Silver Purchase Act, killed the bill for coining the seignorage, maintained the treasury's gold reserve by the successive issue of government bonds and saved its credit throughout the world, despite furious opposition by large sections of his own and the Republican party favoring the free coinage of silver. He repudiated the Hawaiian annexation treaty made by President Harrison, enforced the neutrality laws during the troubles in Cuba, while firmly supporting American interests there, and insisted upon arbitration of the British-Venezuelan boundary dispute. During the Chicago strike in 1894, he effectively asserted the executive's right to interfere in State affairs in the interest of law and order. At the close of his term he settled in Princeton, N. J., where he resided till his death. He delivered an annual series of lectures on public affairs at Princeton University and wrote a number of articles on important questions with which he was required to deal while President. In 1904 he was much talked of as a candidate for a third term, but emphatically declined to be so considered. In 1884 Cleveland's popular majority was 62,683; in 1888 it was 98,017; in 1892 it was 380,810.

President Cleveland's messages and other public papers will be found in Richardson's ‹Messages and Papers of the Presidents, 1789–1897› (Vols. VIII, IX, Washington 1898). A collection of his magazine articles appeared in book form (1904) under the title ‹Presidential Problems,› and he also published ‹Fishing and Hunting Sketches› (1906).

Bibliography.— Campaign lives of Cleveland by Thomas W. Handford and Eugene T. Chamberlain, Wm. Dorsheimer, Pendleton King and Deshler Welch, appeared in 1884; of these Hanford-Chamberlain's is the fullest and most authentic. Consult also Foster, ‹A Century of American Diplomacy› (New York 1900); Gilder, ‹Grover Cleveland› (New York 1910); Henderson, ‹American Diplomatic Questions› (New York 1901); Hensel and Parker, ‹The Life and Public Services of Grover Cleveland› (New York 1906); McClure, ‹Our Presidents› (New York 1905); Parker, ‹Recollections of Grover Cleveland› (New York 1909); Rice, William Gorham, and Stetson, Francis Lynde, ‹Was New York's Vote Stolen?› (New York 1915); «Siva,» ‹A Man of Destiny› (New York 1885); Whittle, ‹President Cleveland› (London 1896); Williams, ‹Mr. Cleveland: A Personal Impression› (1909).

W. N. C. Carlton,
Librarian, Newberry Library, Chicago.

CLEVELAND, England, a hilly district in the North Riding of Yorkshire, about 28 miles long and 15 broad, between the Tees and the coast at Whitby and giving its name to one of the parliamentary divisions of the county. The district gave the name to a famous breed of horses, the Cleveland bays. It has developed enormously since the discovery of its extensive deposits of iron ore, which is smelted chiefly at Middlesbrough.

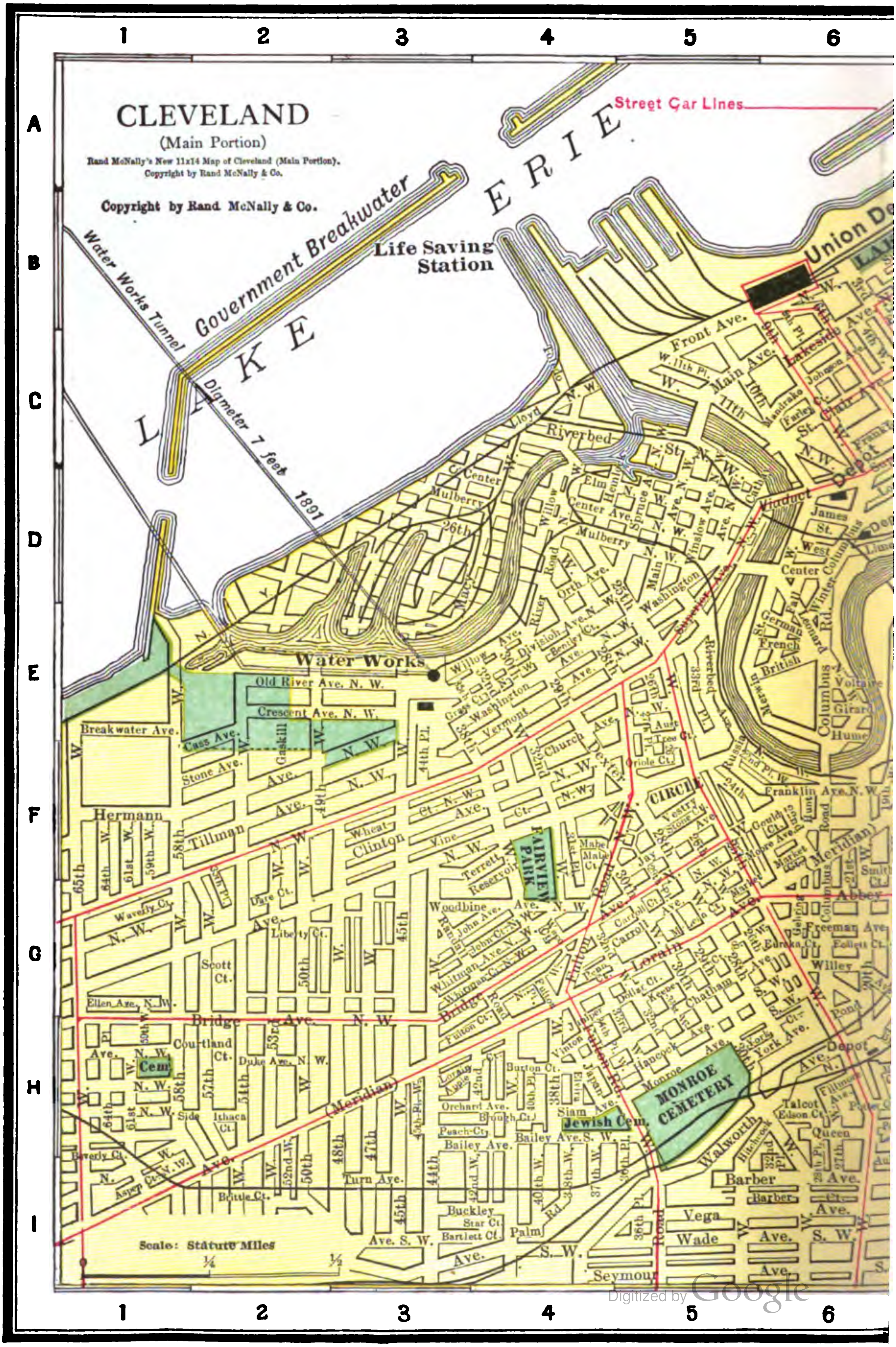
CLEVELAND, Ohio, city and county-seat of Cuyahoga County. The city of Cleveland was chartered in 1836, 21 years after its incorporation as a village in 1815; the original survey was made under the superintendence of Moses Cleaveland for the Connecticut Land Company in 1796. It is now the sixth city of the country in population and manufactures, its position on the south shore of Lake Erie, giving it direct contact by rail and lake with sources of America's great mineral wealth. The city has an area of 56.65 square miles and lies on a plateau 100 feet above the lake and 580 feet above the sea-level; 357 miles by rail east of Chicago; 140 miles northwest of Pittsburgh; 623 miles by rail northwest of New York; and 183 miles west of Buffalo. The city's location, as regards the Great Lakes, and its proximity by rail to the coal and coke regions of Ohio and Pennsylvania are great assets. Its geographical position has made it the most economical point in the United States for the assembling of these ingredients of iron and steel and it is not out of place to mention that the Standard Oil Company had its beginning here. To picture the Cleveland of 1918 in the terms of the 1910 census is to have stopped the activities of 850,000 people for the busiest years in their history. The tax duplicate of Cuyahoga County, in which Cleveland is located, has increased over $278,000,000. The assessed valuation of Cuyahoga County is $1,491,086,810, which is greater than that of any one of 34 States of the Union, and exceeded by only 14. Over $33,000,000 were added to the deposits of Cleveland banks during the 12 months of 1917. The bank deposits of Cleveland in 1917 amounted to $522,229,391, and are assessable but not assessed. The bank clearances for 1917 show a gain of 50 per cent over 1916, or about $1,256,287,918. The building permits show that Cleveland is essentially a city of individual homes as well as of great mercantile and industrial establishments, and figures also should take into account the growth of adjoining suburban communities where thousands of Clevelanders have their homes. The total number of building permits in Cleveland for the year 1917 was 11,952, at a valuation of $30,483,750.

Manufactures.— The total value of goods manufactured in Cleveland in the year 1914 was $352,418,052, an increase of $80,457,052, or 29.6 per cent over the figures of five years previous. The capital invested in Cleveland manufactures was $312,908,956. The number of industrial «establishments» enumerated by the census was 2,346, as compared with 2,148 in 1909. The value of material used was fixed at $198,515,000 as against $154,915,000 in 1909, a gain of 28.1 per cent. The value added by manufacture to these products was $153,925,488, an increase in five years of 31.5 per cent. The value added by manufacture formed 46.3 per cent of the total value in 1914, and 43 per cent in 1909. The salaries and wages of industrial plants in 1909 were $63,559,000, and this rose in 1914 to $92,868,865, an increase of 46.1 per cent. The number of salaried employees was 17,766 in 1914 as compared with 12,240 in 1909, making an increase of 5,526, or 45.2 per cent. The average number of wage earners in 1914 was 103,334, as against 84,728 in 1909, the increase being 18,496, or 22 per cent.

Industries and Value of Output.—Iron and steel works and rolling mills, $58,752,000; foundry and machine shop products, $50,951,000; automobiles, including bodies and parts, $27,117,000 (an increase of 486.4 per cent over 1904); slaughtering and meat packing, $24,737,000; women's clothing, $16,243,000; printing and publishing, $14,099,000; paint and varnish, $10,093,000; men's clothing, including shirts, $9,546,000; malt liquors, $6,528,000; stoves and furnaces, including gas and oil stoves, $8,621,000; bread and other bakery products, $6,908,000; electrical machinery, apparatus and other supplies, $11,358,000; hardware, $5,766,060; lumber and timber products, $4,916,000. Industries in which the production passed the million dollar mark include copper, tin and sheet iron products, confectionery, hosiery and knit goods, tobacco manufactures, brass and bronze products, cutlery and tools, cars and general shop construction and repairs, chemicals, millinery and lace goods, fancy and paper boxes, furniture and refrigerators, patent medicines and druggists' preparations and shipbuilding. Only New York has a larger production of women's outer garments than Cleveland, where something like 10,000 people are engaged in this one industry. Over a half million dollars a year is spent for designing alone. There are no sweatshops in the Cleveland garment industry, no child labor, no exhaustive rush season with its subsequent long season of slackness and unemployment. In direct contrast to conditions in other garment manufacturing cities, Cleveland's plants are models in construction, sanitary conditions and welfare provisions.

Commerce.— Cleveland's remarkable growth in wealth and population is mainly due to its excellent geographical situation. It is the economic focus of the Lake Superior iron and the Middle States coal regions; and nowhere else in the United States can these two products be brought together with less cost for transportation. In 1917 the total movement of freight was 37,306,259 net tons, of which 24,877,522 tons were received and forwarded by rail and the remainder by lake. Grain receipts in 1917 amounted to 13,037,254 bushels and grain shipments to 5,190,256 bushels. These totals included 2,094,953 bushels of wheat received and 598,595 bushels shipped; 2,023,555 bushels of corn received, 1,226,335 bushels shipped; 4,575,497 bushels of oats received, 1,888,681 bushels shipped; 54,070 bushels of barley received, 72,383 bushels shipped; and 268,984 bushels of rye and other cereals received, 93,842 bushels shipped. Flour receipts were 804,039 barrels and shipments 262,084. Iron ore receipts in 1917 aggregated 9,077,161 gross tons. Cattle and calves received in 1917 numbered 135,560, hogs 648,332 and sheep 182,065. The 1917 imports at Cleveland were valued at $10,812,369 and the exports at $6,859,935. For the Ohio customs district of which the city is the headquarters, imports amounted to $16,616,285 and exports to $40,998,255.

Civic Growth.— The civic growth of Cleveland has not lacked in interest. Its group plan of public buildings is (1918) approaching visualization, inasmuch as the Federal, county and municipal buildings are completed, and these, with the Public Library, will mark the four corners of the project. This work has been the outgrowth of many years' work on the part of the Cleveland Chamber of Com-

CLEVELAND
(Main Portion)
Rand McNally's New 11x14 Map of Cleveland (Main Portion).
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Riverbed St.
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Cass Ave.
Stone Ave.
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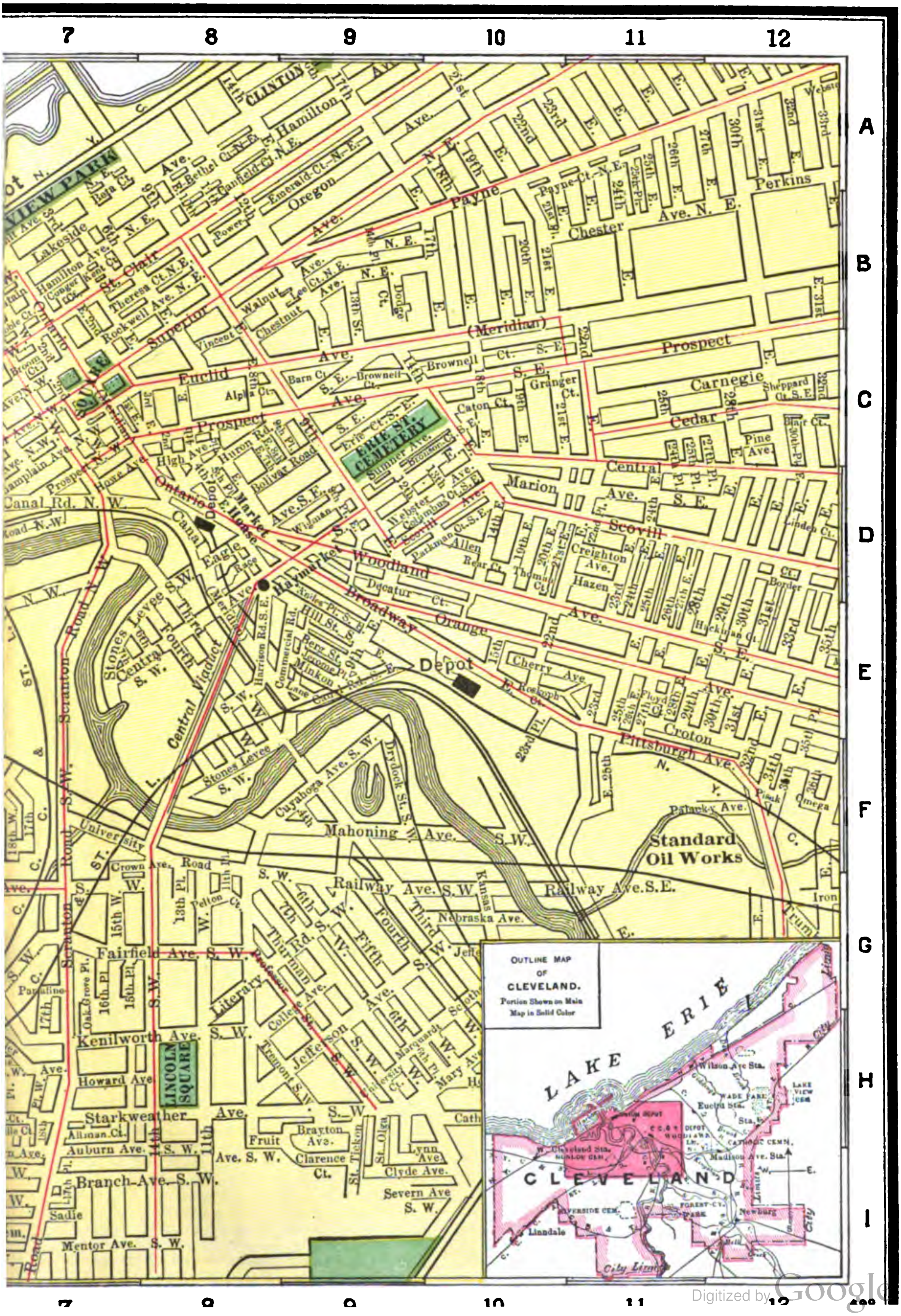
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Carnegie
Cedar
Central
Ave. S. E.
Scovill
Marion
Woodland
Broadway
Orange
Cherry Ave.
Croton
Pittsburgh Ave.
ERIE ST. CEMETERY
Canal Rd. N. W.
Ontario
Market House
Haymarket
Central Viaduct
Depot
Stones Levee
Cuyahoga Ave. S. W.
Drydock St. S. W.
Mahoning Ave. S. W.
Railway Ave. S. W.
Railway Ave. S. E.
Standard Oil Works
University
Scranton Road S. W.
Fairfield Ave. S. W.
Kenilworth Ave. S. W.
Howard Ave.
Starkweather Ave.
Auburn Ave. S. W.
Branch Ave. S. W.
Mentor Ave. S. W.
LINCOLN SQUARE
Literary
Professor St.
Jefferson
Tremont
College Ave.
Fruit Ave. S. W.
Brayton Ave.
Clarence Ct.
Lynn Ave.
Clyde Ave.
Severn Ave S. W.
Nebraska Ave.
Kansas
OUTLINE MAP OF CLEVELAND.
Portion Shown on Main Map in Solid Color
LAKE ERIE
CLEVELAND
Wilson Ave Sta.
WADE PARK
LAKE VIEW CEM.
Euclid Sta.
Union Depot
W. Cleveland Sta.
MONROE CEM.
Madison Ave. Sta.
CATHOLIC CEMN.
RIVERSIDE CEM.
FOREST CY. PARK
Newburg
Linndale
City Limits
N
W.
E.
7
8
9
10
11
12

merce, the city administration being assisted by such well-known architects as the late Daniel H. Burnham, John M. Carrere, Arnold W. Brunner and John C. Olmsted. The first two named buildings overlook the shore of Lake Erie and the other two face Superior avenue. Between the two buildings on the lake front is to be constructed a Union Depot of commensurate dignity with the other public buildings and at a cost of about $4,500,000. From this station a Mall 570 feet wide will extend to the Federal and Library buildings, a distance of nearly 2,000 feet. The arrangement for the transfer of surface city land on the lake front to the railroads will produce $1,400,000, which will be available for the future acquisition of property remaining to be acquired in the proposed Mall. However, owing to delay in the building of the Union Station on the lake front and by reason of changing conditions, it may be consolidated with other terminal stations in and about the Public Square. It might be said that the cost of the City Hall Building is about $3,330,000, the County Building about $5,000,000, the Federal Building $3,875,000 and the Library $3,000,000, making something like $15,000,000 for building purposes alone. A referendum for a bond issue of $2,500,000 was voted favorably upon at the 1917 election for a Public Hall and Auditorium. Work already has been commenced on this building and is progressing as rapidly as possible under existing war conditions.

Bridges.— Officially and legally Cleveland is one city, but from the earliest days it has been in reality two, divided at its centre by a deep ravine and flats, through which the Cuyahoga River makes its way to Lake Erie. Factories, docks and warehouses, with both water and rail facilities, find in the flats an advantageous location, but through traffic down one side and up the other has been out of the question from the first. It was to obviate this that 40 years ago the Superior Viaduct, three-quarters of a mile of stone arches, with a swing bridge at the river, was erected, but the swing bridge to let the lake boats through to the up-river docks, with its 15 minutes' delay several times a day, was enough to choke the development of the west compared with the prosperity of the east side, where the business district grew up around the Public Square and public buildings. A second viaduct was erected farther south between Central avenue on the east side and Clark avenue and West 14th street on the west, but the steady growth of the city made even these provisions inadequate, and a new high level bridge has been completed to connect Superior avenue and the Public Square on the east with Detroit avenue on the west, at a total cost of approximately $3,000,000. This bridge has two levels to carry the immense traffic between the east and west sides. It spans the river at a height which allows the tallest stacks and masts on the Great Lakes to pass under it, 96 feet above mean lake level and 93 feet above the highest known water level. The upper floor of the bridge is 121 feet above the river. Six street car tracks occupy the lower level of the bridge, and roadway and sidewalk the upper. The river span is of steel, 591 feet in length, and 12 spans of concrete carry the rest of the upper structure, which has a length over all of 2,880 feet. The width is 81 feet 6 inches; width of roadway, 45 feet; width of sidewalks, 14 feet 9 inches each. Twenty-eight miles of concrete piles were used, 108,000 cubic yards of concrete, 3,000 tons of reinforcing steel and 3,800 tons of structural steel. Five million dollars has been voted for another bridge across the river between Huron road and Lorain avenue.

Harbor Facilities.— Cleveland has 14.2 miles of lake frontage, protected by a breakwater 5¾ miles in length, which has been constructed by the Federal government at a cost of approximately $6,000,000, while an additional $1,000,000 has been expended in dredging and maintenance. The total lake front protected by the breakwater is 28,035 feet. The harbor has a spacious entrance, and the extension of East Ninth street has made possible the construction of two passenger piers, affording ample dockage for passenger service from Detroit and Buffalo. These docks are located east of the harbor entrance, while the harbor to the west affords unexcelled facilities for handling iron ore. The Cuyahoga River, which flows into Lake Erie at Cleveland, is also lined with docks, adjacent to which are many furnaces, factories and lumber yards.

Public Health, etc.— The average annual mean temperature of Cleveland for a period of 33 years was 51.30°. The highest temperature in 1917 was 95° F. and the lowest 8° below zero. The normal rainfall is 35 inches. According to the city's new charter, the department of health includes the bureau of food and dairy inspection, division of housing, bureau of child hygiene and bureau of tuberculosis — the last named one of the model institutions of the country.

Notable Buildings.— Euclid avenue, formerly renowned for its spacious lawns and elaborate homes, is rapidly becoming the new shopping district of Cleveland. Under the Cleveland Building Act, which regulates the height of the building by the width of the avenue on which it fronts, 12 stories is the ordinary limit for office building construction. This, it is hoped, will produce something of a uniformity of heights rather than a skyline composed of ill-proportioned skyscrapers and abnormally low buildings. Substantiality, rather than excessive height or garish design, marks the present day building construction here. The Rockefeller Building, the Brotherhood of Locomotive Engineers Building, the new Guardian Savings Bank, the Williamson, Citizens' Savings & Trust Company, the large department stores of the May and Bailey companies, William Taylor & Son Company, the Halle Brothers Company, the Higbee Company, the banking establishments of the First National, the Cleveland Trust Company, Union Commerce National and the Cleveland National banks are interesting examples of modern construction, as are the Swetland, Rose, Garfield, American Trust, Cleveland Electric Illuminating Company, *Leader-News*, Cleveland *Plain Dealer* and *Press* newspaper buildings, the Statler, Olmsted, Hollenden, Winton and Cleveland hotels. In semi-public buildings the Cleveland Athletic Club structure, the Y. M. C. A., the Hippodrome Theatre and the new Federal and municipal buildings, which are located on the proposed Mall, are important features of Cleveland's architectural growth. There are four large arcades on Euclid avenue, reaching through to Superior and Prospect avenues, that are of distinctive architectural interest.

Boulevards, Parks, etc.— The first park was given to the city by J. H. Wade in the early 80's. The present park system was initiated by a group of six men. Mr. Charles Bulkley was elected first president of the Park Board in 1888, and much of the credit for Cleveland's 2,428 acres of city parks and 43½ miles of well-paved boulevards belongs to him and the Park Board as then constituted. Along the lake front in the heart of the city are open grounds marked by the entrance to the proposed Mall; five miles east of this lies Gordon Park, a beautiful spot donated by the late W. J. Gordon, containing 113 acres of lawn and woods; six miles to the westward is Edgewater Park, stretching 6,000 feet along the lake and containing 125 acres of attractive playgrounds. These are the principal park sites, but six miles back of Gordon Park, connected by a magnificent boulevard, lies Shaker Lakes, a beautiful natural spot of 300 acres, just outside of the city limits in the attractive suburb of Cleveland Heights. Mr. Patrick Calhoun gave a piece of land lying between Euclid avenue and Cedar avenue which forms the gateway to the Shaker Lakes. About equal distance to the south of Edgewater Park lies Brookside Park, and midway between this and Garfield boulevard is Woodland Hills Park of 113 acres filled with playgrounds and devoted to athletic sports, while Garfield, Lakeview, Lincoln and Washington parks, with Monumental park in the Public Square, afford extensive and attractive breathing spots for Cleveland's growing populace. At the entrance of Edgewater Park and beginning a boulevard system that leads from the new high level bridge and extends to the extreme western limit of the city is Bulkley boulevard. A new public bath house was erected at Edgewater Park ready for the opening of the 1914 season. The building is designed in Spanish Mission style, is a very permanent style of construction with steel frame and fireproof walls. The building is 314 feet long, 50 feet wide, of sanitary construction, with cement and tile floors and cement plastered walls. The upper floor at the west end of the building contains an open pavilion and restaurant for spectators. The lower floors contain 665 separate rooms and two locker rooms for boys, furnishing in all accommodations for about 3,000 bathers at one time. A concrete retaining wall has been built in front of the bath house to keep the beach from extending farther inland. The city's recreational facilities may be said to contain 18 playgrounds, 3 public baths, 2 municipal dance halls, 43 baseball diamonds, 15 football grounds, 67 tennis courts and 14 skating ponds. Brookside Park contains a zoölogical garden in which 154 acres are utilized. The valley connecting Gordon Park with the Shaker Lake district is known as Rockefeller Park, much of the territory being donated by Mr. John D. Rockefeller, whose estate at Forest Hill is a park in itself. At Edgewater Park a municipal dance hall is maintained, while at Woodland Hills Park there is a «neighborhood center» and the shelter-house there is utilized as a dance pavilion in the same manner as at Edgewater. Refreshment stands and a small charge for dancing privileges make the receipts not only cover expenses but show a small net profit. A vacant lot and home garden movement has obtained a strong foothold in Cleveland and in 1917 more than 15,000 «war gardens» were cultivated, producing about $300,000 worth of vegetables.

Public Utilities.— The greater part of the electric light, power and steam heat for the city and surrounding towns is furnished by the Cleveland Electric Illuminating Company. The newly erected municipal electric lighting plant was started on 1 July 1914; it has a capacity of 25,000 kilowatts. The city water is taken from Lake Erie through a series of tunnels connected with water stations, or cribs, some distance from shore. There are 985 miles of mains and the daily consumption in 1917 was 103,882,227 gallons. A $3,500,000 filtration plant with a capacity of 150,000,000 gallons of water per day was ready for operation 1 Nov. 1915. Three new sewage disposal plants are under construction.

Area, Streets, etc.— The area of the city of Cleveland is 56.65 square miles. The total length of streets and alleys is 917.5 miles, of which 603.2 miles are paved. There are 792 miles of sewers, a number of which are located outside of the city limits, carrying the sewage to the points of disposal. Since 1900 there have been 59 railway grade crossings separated, and there still remain 180 railway crossings at grade, of which 23 are switch tracks; 30 of the main line crossings will be separated in the near future as litigation for this purpose has either been completed or is pending.

Railroads.— Seven trunk lines touch Cleveland, viz., the New York Central, the Pennsylvania, the Cleveland, Cincinnati, Chicago & Saint Louis, the Baltimore & Ohio, the New York, Chicago & Saint Louis (Nickel Plate), the Erie and the Wheeling & Lake Erie. The largest fresh-water passenger steamships in the country supply daily service between Cleveland, Buffalo and Detroit, and there is also through passenger steamboat service to Duluth. The Cleveland Railway Company operated 372 miles of track in 1917 and owned 1,477 revenue cars, with a seating capacity of about 73,850 persons. Under the «Tayler Plan» of operating the Cleveland railway, the city controls the service under the supervision of a street railway commissioner who fixes the schedules, routes, stops, etc., and reserves the right at all times to take over the entire system, in the meantime guaranteeing 6 per cent on investment. This guarantee is governed by a sliding scale, which is regulated from time to time by withholding or extending the penny price of transfers. The maximum rate is four cents cash, or seven tickets for 25 cents, and one cent for a transfer. This rate is now in force, 1 June 1918, but may have to be increased because of increased cost of labor, materials and equipment.

Fire and Police Service.— The divisions of fire and police are operated by the department of public safety in Cleveland. There are 604 firemen, separated into 54 companies, and 807 policemen, operating from 14 precincts. The appropriation for the division of police for the year 1918 is $1,350,741; for the division of fire, $1,038,491.

Libraries and Museums.— The Cleveland

CLEVELAND, OHIO

1 New High Level Bridge across Cuyahoga River, connecting East and West sides of Cleveland
2 New Terminals of C. & B. Line and D. & C. Line, East Ninth Street, Cleveland
3 Federal Building

Public Library, whose prospective home will make the fifth building in the group plan of public edifices, contains over 600,000 volumes. There are 14 large branch libraries and 11 smaller branches, 8 high school and 10 grade school libraries, 42 deposit stations, 66 delivery stations and 6 children's stations, also 486 classroom libraries, the Municipal Reference Library and the Library for the Blind, making 645 agencies for circulating books in addition to the main library. The Case Library has 90,000 volumes and the Adelbert College Library 93,000. The Cleveland Museum of Art (incorporated in 1913) is based on the John Huntington Art Polytechnic Trust and the Kelley Trust, which became in 1913 the Horace Kelley Art Foundation.

Education.— Cleveland is conspicuous for its system of public instruction. In 1917 there were 116 public elementary schools, with 3,017 teachers and 91,983 pupils; 14 public high schools, 9 junior high schools and 10 parochial high schools. The city is the seat of Western Reserve University, with academic, medical, pharmaceutical, dental, law and library schools; the Case School of Applied Science; a public Normal Training School and a private kindergarten training school, besides numerous private and commercial schools, schools for nurses' training, art, music, languages, etc. Other colleges are Saint Ignatius College and the Cleveland School of Pharmacy.

Finances.— In 1917 the real estate valuation was $747,785,510, the personal property valuation $450,928,050 and the total tax rate $15.55 per $1,000. The city has six national banks and a Federal Reserve Bank. The bank clearances for 1917, as reported by the Cleveland Clearing House, were $3,730,204,000, as against $2,473,916,082 in 1916.

Federated Charities.— The Welfare Federation of Cleveland, through its 59 affiliated organizations, which render practically every kind of human service, during the year 1917 aided over 33,100 people, from giving them food and clothing to caring for them when sick and providing wholesome recreation. The Federation, as a central office, since its inception four years ago has cut the cost of charitable collection one-third and has greatly increased the amount of money collected and the number of givers. It has increased the efficiency of the separate organizations and promoted co-operation among them. The Federation was unique at the time of its organization in having specific representation of organizations, donors and the city at large on its board of trustees and in planning not only financial but social work. It is still the largest institution of its kind in the world.

Modern Reformatory Methods.— Cleveland's most widely known public institution of charity and correction is the Warrensville Farm Colony. The division of charities and correction presents the problem of developing the usefulness of Cleveland's unfortunate, delinquent and dependent people as well as caring for the sick and poor for their own sake and for the protection of the community. This is done through two institutions somewhat peculiar to Cleveland in their construction and operation. One is known as the «Farm Movement» at the City Correction Farm at Warrensville, Ohio, and the other is the House of Correction at Hudson. These institutions are the outgrowth of the city's desire to furnish better opportunities for its unfortunates in accordance with a special ordinance of the city council. The great tract of land at Warrensville, consisting of about 2,000 acres, was originally named the Cooley Farms, in recognition of the welfare director who planned and executed the Cleveland system of handling minor violators of the law. The Correction Farm property consists of a Colony Farm or the place of residence of the infirmary or almshouse group of people; the Overlook Farm, on which is erected the new sanatorium for tuberculosis patients; the Correction Farm, on which is the workhouse or house of correction group; and the Highland Park Farm, on which has been laid out a magnificent municipal cemetery. Each one of these separate farms consists approximately of 500 acres of land. Together they form a great tract in one body over 2,000 acres, or more than three square miles, which furnishes a favorable environment and varied opportunities for work to the residents and inmates of the different villages. It is not a collection of institutions located on an ordinary farm in the country. It is rather a group of estates, each one set apart to special uses. With this large area it is possible to have the different groups entirely distinct, and at the same time secure the advantage of controlling a large environment. Reference to the tuberculosis sanatorium on Overlook Farm may give some idea of the general policy of the city toward these institutions. The tuberculosis sanatorium was made possible by the $250,000 bond issue voted for by the city in 1910. The site is on a high ridge, over one-half mile south of the colony group. It is of the mission style of architecture, as are many of the other buildings, with white plaster finish and red tile roofs. The building stands 600 feet above the city and is protected on the north and northwest by a forest of 70 acres, while from the other side it looks out over miles of surrounding country. The hillsides are planted with pine, fir and balsam, which help to make an ideal environment. For seven years before erecting these permanent buildings, the city maintained a temporary sanatorium with accommodations for about 80 patients, in which in all 1,248 cases were treated and the success of the treatment justified the expenditure of the larger amount for permanent buildings.

Churches.— There are in Cleveland about 425 churches of all denominations, many of which occupy buildings of monumental architecture. The churches include 70 Roman Catholic, 32 Baptist, 2 Christian Reformed, 2 Church of God, 31 Congregational, 11 Disciple, 25 Episcopal, 7 Evangelical, 2 Free Methodist, 3 Friends, 14 German Evangelical Synod, 19 Lutheran, 53 Methodist Episcopal, 27 Presbyterian, 1 Welsh Presbyterian, 1 Reformed Church in America, 1 Reformed Church of Hungary, 14 Reformed Church in the United States, 2 Dutch Reformed in America, 1 Reformed Episcopal, 2 Swedenborgian, 1 Unitarian, 5 United Brethren, 1 United Evangelical, 6 United Presbyterian, 1 Universalist and 40 miscellaneous.

Newspapers.— Cleveland has one morning and two evening English newspapers with a circulation of 470,000 daily and two Sunday newspapers with a combined circulation of 325,000.

Commercial Organization.—The Cleveland Chamber of Commerce was founded in 1848 as the Board of Trade of the City of Cleveland and was reorganized in 1893 as The Cleveland Chamber of Commerce. Since 1899 it has occupied its own building in the northeast corner of the Public Square. The Chamber has become famous for its activity along civic lines, closely identified with all important civic movements. It initiated the Group Plan for Cleveland public buildings, the Welfare Federation of Cleveland and the new tenement-house code. Throughout the year speakers of national reputation address Tuesday luncheon meetings of the membership. The organization's facilities include a large auditorium with a seating capacity of 1,000, a club, restaurant and a commodious library. There is a Manufacturers' and Wholesale Merchants' Board, a Convention Board, a Retail Merchants' Board, an Association of Women's Wear Manufacturers and a Traffic Bureau maintained in connection with the Cleveland chamber.

War Activities.— With the entrance of the United States into the world war Cleveland became one of the most important munitions and war accessories centres in the country. Almost since the beginning of the war Cleveland industries have been actively engaged in the manufacture of war materials for the Allied governments. When the United States became an active participant Cleveland industries at once began to organize so that they might give the government the most efficient co-operation. A war industries commission, organized by the Chamber of Commerce, made a complete survey of Cleveland's industries, so that government contracts could be handled without loss of time and in a manner calculated to give the government the best possible industrial service. This survey includes equipment of plants, capacity, material it can produce, number of workmen and other data which shows at once in what quantity and at what speed any needed war materials can be turned out either in part or as a whole. Cleveland now is manufacturing practically every war necessity from uniforms to tanks and transports. The big plant and laboratories of The National Electric Lamp Association at Nela Park have been turned over for government research work.

The Housing Problem.— Cleveland, like other large industrial centres, early in the war faced the problem of caring for tens of thousands of workers, permanent and "floating," attracted to the city by increased wages, improved working conditions and the expansion of industry. Early in the fall of 1917 a survey made by the Chamber of Commerce showed that there was urgent need for at least 10,000 homes which could be sold at around $3,500 on easy payments and rental properties which would bring from $18 to $30 per month. The corporation known as The Cleveland Real Estate and Housing Company was organized by a number of the city's leading business men and social workers. While this company is not a philanthropy its incorporators will handle the housing problem at a minimum expense and with minimum profits. One of the problems that this organization will work toward solving will be providing proper accommodations for more than 15,000 negroes.

Foreign Trade.— The foreign trade department of the Chamber of Commerce, since its organization early in 1915 as a co-operative branch of the Bureau of Foreign and Domestic Commerce of the Department of Commerce, co-operated in an unofficial capacity with the War Trade Board at Washington, in assisting and advising Cleveland exporters and importers with respect to Trading with the Enemy and the Exports Control acts.

City Government.— The city of Cleveland is governed under a charter prepared and proposed by a charter commission at a popular election on Tuesday, 1 July 1913. In order to get a comprehensive grasp of the more important provisions of the Cleveland government the following brief outline may be of assistance: Party primaries are eliminated, candidates for municipal office being nominated by petition only. The short ballot principle has been carefully observed. At each election the voter is called upon to express his choice for only two officials — the mayor and the council from his ward. The recall is provided for city officials upon a petition signed by 15,000 electors in case of officials elected at large and 600 electors in case of officials elected from wards. The charter provides for a council of 26 members elected from wards for a term of two years, the salaries to be fixed by the outgoing council and its functions limited to legislation. The mayor and heads of departments have seats in the council with the right to take part in discussions, but without a right to vote. A proposed ordinance may be placed before the council by an initiative petition signed by 5,000 electors. If not passed by the council it must be submitted to the voters at the next regular election, or an additional petition containing the signatures of 5,000 additional electors will compel its submission to a vote of the people at a special election. If a majority of those voting thereon vote in favor of the proposal it thereby becomes an ordinance. A petition of 10 per cent of the total vote of the last municipal election will compel the submission of an ordinance to a vote of the people. The mayor is elected for a term of two years and responsibility is definitely fixed on him for the proper administration of the affairs of the city. The administrative functions are divided among seven departments with a director at the head of each appointed by the mayor. These are the department of law; department of public service; department of parks and public property; department of public welfare, having to do with health, charities, recreation, research and publicity and employment; the department of public safety, including the divisions of police, fire, buildings, housing inspection and weights and measures; the department of finance, embracing the divisions of accounts, treasury, assessments and licenses, and the division of public utilities for the supervision of water, light and heat. Appropriate functions are either assigned to these divisions in the charter or the power is given to the council to so assign by ordinance. A civil service commission is also provided for. It was the belief of the commission in presenting this charter to the voters that it would provide a simplified election system, definitely fix the responsibility upon administrative officers, secure an adequate accounting system, conserve the rights of the city in matters relating to franchises, provide a merit system in the appointment of public officers and furnish Cleveland with a far better form of government than under the former plan. A preferential plan of elections provides for first and second choice ballot, and if no candidate shall receive a majority of the first-choice votes, then the second-choice votes received by such candidate shall be added to the first-choice votes and the candidate receiving the largest number of first and second-choice votes combined, if such constitute a majority, shall be elected.

History.— For the claim of Connecticut to the territory from lat. 41° to 42° 1′ N. and 120 miles west of the Pennsylvania line, see WESTERN RESERVE. That State conveyed its title to the Connecticut Land Company, which in 1796 sent out Moses Cleaveland to survey the land and establish "New Connecticut"; and his party, having surveyed 60 miles, ran the line north to the Cuyahoga and followed it to the lake, reaching the latter 22 July. Cleaveland at once fixed on the plateau as the capital of the new State, and had it laid out, with the square and its two main streets (not intersecting) as now, with the same names, but Euclid (then called Middle Highway) only starting from Huron street; it was not cut through to the square until 1815. The settlement was given Cleaveland's name, but not his chosen spelling, the first survey map bearing "Cleveland"; usage fluctuated, but was fixed in 1831 by the adoption of the shorter form by a newspaper, it is said because the "a" would not go into a headline. The soil being poor, most immigrants went on into the interior; early commerce was on the Ohio, and for a decade Cleveland remained a hamlet with a few dozens at most, those mainly Connecticut people. It became a part of Jefferson County in 1797, of Trumbull County in 1800,— the United States having assumed administration over the Western Reserve,— and of Geauga County, its county-seat in 1805, just after it had become a port of entry; in 1810 Cuyahoga County was formed with Cleveland for its seat, probably having about 100 inhabitants. They must have been of good quality, however, as a library was started in 1811. In 1814 Newburg was set off, and for many years was the more important of the two, from its water power. On 1 June 1815 Cleveland was incorporated as a village; and in 1816 the first bank was started. In 1818 the first newspaper was issued, the Cleveland *Gazette and Commercial Register*. In 1820 it had grown to 600. In 1824 the first steam vessel was launched. But two great events happened to it near the end of the decade. In 1827 the Ohio Canal was opened to Akron and in 1832 to the mouth of the Scioto at Portsmouth; and in 1828 the cutting of a channel across the bar at the river mouth, giving it 10 feet of water, was completed. These were its making, and with about 1,000 in 1830 the town had grown to over 6,000 in 1840. In 1836 with about 4,000 people it received a city charter, two days after its neighbor Brooklyn across the river had received one as the "City of Ohio," which lasted until 1853, and was then annexed to Cleveland. In 1834 a horse railroad with wooden rails was built to Newburg. The same year five steam railroads were chartered from Cleveland to everywhere, and the Ohio Railroad to the Maumee sold a good deal of stock; but the panic of 1837 ended such speculations, and it was not until 1846 that more were even chartered, and about five years later before the first one was built. The advantage was immense, and it leaped from 17,000 to 43,000 within a few years. About the time of the Civil War the iron industry began to take root and the manufacture of iron products for the government during the war crowded its manufactories, as did that of clothing. Since then its history is mainly that of an enormously expanding industrial city, but one that has never forgotten to keep its intellectual growth and the spirit of culture abreast of its material development. In 1872 it annexed East Cleveland; in 1873 Newburg; in 1893 West Cleveland and Brooklyn. In 1896 it celebrated its centennial.

MYRON T. HERRICK,
President of Cleveland Chamber of Commerce.

CLEVELAND, Tenn., city and county-seat of Bradley County, about 30 miles from Chattanooga, on the Southern Railroad. In addition to the usual industries of a town in an agricultural region, it has stove-works and woolen and flour mills, chair factory, hosiery mills, ice and cold-storage plant, lumber and planing mills and a coffin factory. It is the site of Centenary Female College. Settled in 1820, it was incorporated about 1880. The waterworks are owned by the city. Pop. 5,549.

CLEVELAND, CINCINNATI, CHICAGO AND SAINT LOUIS RAILWAY COMPANY, The. This road, better known as the "Big Four Route," was chartered in Ohio in 1889 as a consolidation of the Cincinnati, Indianapolis, Saint Louis and Chicago Railway, the Cleveland, Columbus, Cincinnati and Indianapolis Railway and the Indianapolis and Saint Louis Railway companies. In 1890 the Ohio, Indiana and Western Railway was purchased. In 1912 the Columbus, Springfield and Cincinnati Railroad, the Harrison Branch Railroad and the Cincinnati and Springfield Railway were added by merger. In 1913 the Cairo, Vincennes and Chicago Railway and the Chicago, Indianapolis and Saint Louis Short Line Railway were added to the system in the same way, and in 1915 another merger brought in the White Water Railroad, the Cincinnati, Wabash and Michigan Railway, the Cincinnati and Southern Ohio River Railway and the Fairland, Franklin and Martinsville Railroad.

On 30 June 1916 the company operated 2,383 miles of road, of which 1,688 miles were owned by the company, the remainder being held under leases, contract, proprietary rights or trackage rights. On 31 Dec. 1915 the capital stock outstanding totaled $57,056,300, of which $10,000,000 was preferred, and $47,056,300 was common. Of the latter the New York Central Railroad owned $30,207,700. On the same date the "Big Four" owned $21,933,868 of the stock of other railroads and $20,082,230 of their bonds. In 1912 the company purchased coal lands in Illinois aggregating 76,000 acres.

For the year ended 30 June 1916 the operating revenue amounted to $43,478,002 and the operating expenses to $29,195,230 — the net operating revenue being $14,282,772. The interest on the funded debt amounted to $4,851,981 and the tax accruals to $1,556,131. Rents paid for leased roads, equipment and other expenses reduced the net income to $7,103,089, of which $6,866,275 was passed to profit and loss account, wiping out a deficiency and leaving a credit balance of $1,763,933.

The year's transportation service totaled 16,851,148 train miles, an average of 7,072 train miles per mile of road. The number of passengers transported was 8,735,964 and the amount of freight moved was 31,443,141 tons, about 15,000,000 tons being bituminous coal. The revenue per passenger carried averaged $1.04, and per passenger mile, two cents. The revenue per ton of freight averaged $0.97, and per ton mile, a little more than one-half cent. The equipment consisted of 804 locomotives, 365 passenger cars, 76 baggage and express cars, 40 postal cars, 400 refrigerator cars, 16,376 box cars, 11,024 coal cars, 1,106 flat cars and 636 stock cars. The road forms a part of the New York Central Railroad system.

CLÉVES, klāv (German *Kleve*), Prussia, chief town of the Rhine province, 70 miles northwest of Cologne and four and one-half miles from the Rhine, with which it is connected by a canal. It has manufactures of machinery, tobacco, leather and cotton. In the centre of the town rises the old and renowned Schwanenburg (Swan's Castle), the ancient residence of the dukes of Clèves, founded, according to tradition, by Julius Cæsar. The collegiate church, dating from the 14th century, contains monuments of the counts and dukes of Clèves. Under the Treaty of Xanten in 1614 Clèves passed into the possession of the Elector of Brandenburg (now represented by Prussia). Pop. 18,135.

CLEWS, Henry, American banker: b. Staffordshire, England, 14 Aug. 1840. He studied for the ministry, but left school to enter mercantile life at New York, whither his father had taken him on a visit. After the panic of 1857 he organized the banking firm of Stout, Clews and Mason, which later became Livermore, Clews and Co. At the outbreak of the Civil War he was appointed by Secretary of the Treasury S. P. Chase government financial agent for sale of bond issues to continue the war. In 1877 he organized and has since been the head of the banking firm of Henry Clews and Co. He was appointed by General Grant fiscal agent of the United States government for all foreign nations. He also was adviser and agent in organizing the new financial system of Japan. He was a founder of the Union League Club, New York, and originated, organized and nominated 65 members of the Committee of Seventy. He published 'Twenty-eight Years in Wall Street' (1885); 'Wall Street Point of View' (1900); 'Fifty Years in Wall Street' (1908); 'Speeches and Essays' (1910).

CLICHÉ, klē-shā', an electrotype or stereotype cast from an engraving used to print from.

CLICHY-LA-GARENNE, klē-shē-lā-gā-rĕn, France (Latin, *Cligiacum*), town in the department of the Seine, near the right bank of the Seine, and on the railway between Paris and Saint Germain, about four miles northwest of Paris. In the 7th century it was frequently the residence of the court. It contains a parish church, the erection of which is due to the celebrated Vincent de Paul, who was curate of Clichy in 1612; and has manufactures of starch, rubber, white-lead, chemical products and varnish, etc. Pop. 46,676.

CLICK BEETLE, a member of the family Elateridæ, also known as the snapping bug and skipjack. When disturbed these beetles curl up and lie on their backs on the ground for a few moments and then begin a series of springs into the air accompanied by a clicking sound. When the beetle lands on its feet it runs off. The larvæ, known as wireworms, are brownish yellow in color and often live several years before attaining maturity. They live under bark and in rotten stumps and some are found in the roots of grass, Indian corn or of certain vegetables. When in great numbers they do considerable damage. Fall plowing is considered the best remedy against them. There are about 500 species in America and 7,000 species are known altogether. Consult De Candeze, 'Monographie des élaterides' (4 vols., Liège 1857–81); and Le Conte, 'Revision of the Elateridæ of the United States' (in *Transactions* of the Philosophical Society, Vol. X, Philadelphia 1853).

CLIENTS, citizens of the lower ranks in ancient Rome who chose a patron from the higher classes, whose duty it was to assist them in legal cases, and to take a paternal care of them. The clients, on the other hand, were obliged to portion the daughters of the patron if he had not sufficient fortune, to follow him to the wars, to ransom him if taken prisoner and to vote for him if he was candidate for an office. If a client died without issue and had made no will, his property fell to the patron. Clients and patrons were under mutual obligation not to accuse each other, not to bear witness against each other and in general not to do one another injury. This relation continued till the time of the emperors. It may be considered as the transition from a patriarchal state, in which family relations are predominant, to a well-developed political system, securing the rights and independence of the individual. In modern law, a client is one who retains or consults an attorney or counsellor at law for advice, or to manipulate any action at law or to represent him in legal matters. The strictest confidence is required of the attorney, the breach of which may be heavily punished.

CLIFF. Nearly vertical rock walls are formed in a variety of ways by natural means. In the development of a drainage system in any high-lying tract of country, ravines, gorges, and canyons are formed by the down-cutting streams, as Watkins Glen, N. Y., the gorge of the Niagara River and the Grand Canyon of the Colorado. After long erosion the softer rocks may be removed, leaving the harder with steep faces standing above the surrounding country, as at the Delaware Water Gap, in the Catskills and many places in the Appalachian Mountains. In high mountains glaciers dig out deep channels. Cliffs formed in these ways may be called cliffs of erosion. Where a high coast borders any large body of water the waves eating into the land form cliffs, as on the northern shores of Scotland, southern England, the coast of Maine and elsewhere. Such cliffs may be called sea cliffs. Cliffs may also be formed by the rock fractures known as "faults," where the rocks on one side of a fracture rise faster than they are worn down by weathering. Such cliffs are not uncommon; they are found in many parts of the West, being especially prominent in arid regions like the Colorado plateau, where weathering is slow. Such cliffs may be called "fault cliffs."

CLIFF-DWELLERS. This term, although of broader application, means in America that prehistoric race that built the houses and villages whose ruins are found in the southwestern part of the United States, and especially in the valley of the Rio San Juan and its tributaries. This river rises in the extreme southwestern corner of Colorado, and flows westward along the borders of adjoining States to a junction with the Rio Colorado. Its course lies mostly in a series of deeply depressed valleys, bounded on each side by tablelands (mesas) with abrupt and lofty faces, which in its lower course confine it in deep and narrow canyons. Its tributaries have cut their way from their mountain-sources down through the soft sandstones of these mesas to the river, forming thus side-canyons, some of which have broad "bottoms" on both sides of the now shrunken streams, always hemmed in by steep walls that have weathered into ledges and recesses varying in depth with the varying hardness of their strata. The principal tributaries from the north are the Animas, the Mancos, the Hovenweep and the McElmo, in Colorado, whose canyons are cut through the Mesa Verde; and the Montezuma in Utah; and from the south the Chaco, in New Mexico, and the De Chelly and Navajo creeks in Arizona. The walls of all these streams, and of lesser tributaries, abound in the cliff-dwellings and other remains of prehistoric inhabitants.

Rumors of such ruins led to an effort by the United States Geological Survey in 1874 to find and investigate them, and a party led by W. H. Jackson and Ernest Ingersoll crossed the mountains in the summer of that year and made a hasty survey of the Mesa Verde region. This party discovered the since famous ruins of the Mancos Canyon and many others westward; and Mr. Ingersoll's letters to the New York *Tribune* in 1874 contained the first intelligent account of them; while Jackson's report, in the Annual Report of the Survey for that year, gave extended details, illustrated from photographs taken in the field of these novel and interesting remains. Since that time extensive explorations of this region by the Bureau of Ethnology and by private persons have brought to light vast additions to this information; and the government has made national reservations of certain districts, in order that these ruins may be preserved and easily visited.

The area in which the cliff-dwellings occur is practically coextensive with that in which are now found traces of town-building and relics attributable to the Pueblo tribes. The general likeness throughout this region (and locally elsewhere in Arizona and northern Mexico) in architecture, implements, style of decoration, etc., shown by the ruins, establishes their close relationship, historically, with the existing village-Indians of the region (see PUEBLO), and shows that in early periods, as now, numerous tribal groups were represented in the region, and that then, as now, "there was a general community of culture if not of kinship in blood." This similarity, and the evidence of records and tradition, make it certain that the builders of these abandoned houses and towns were men of the same sort as, if not directly ancestral to, the modern Pueblo Indians.

The valleys occupied are characterized, as has been said, by cliff-like walls of sandstone enclosing large spaces of flat bottom-lands, in which the soil is fertile when supplied with water. It will produce good crops under irrigation — an art well understood by both ancient and modern inhabitants of that arid region. The annual rainfall even now is considerable, and there is evidence that anciently it was much more copious.

As to the origin of these vanished "cliff-dwellers" nothing is known; but it is evident that centuries ago these valleys were occupied by a considerable, sedentary population, who had fixed homes and cultivated fields for crops of corn (maize), beans, gourds and probably other things, by means of extensive systems of irrigation. They made pottery, cloth, baskets, etc., and stone implements, but nothing metallic.

In this peaceful and industrious life they were exposed, however, to raids from the nomadic and more savage tribes of the mountains and plains north and east of them, and hence were compelled to concentrate their homes into defensive villages, to build fort-like walls and erect watch-towers along their frontiers and on surrounding heights. These structures, as indicated by their ruins, appear essentially like those now occupied in New Mexico and Arizona. The habits and general culture of these prehistoric people, or peoples, were apparently much the same as those of their descendants when first visited by Spanish explorers in the 16th century.

The walls of the canyon-valleys were composed of sandstones in strata of varying hardness, so that in many places the wearing away of a softer layer left a long horizontal recess, sometimes several yards in depth, overhung by harder rock. These natural shelters were sometimes low down and easily accessible, and were naturally taken advantage of as good situations for storehouses for grain and for residence. Often there was room for only one or two houses, which could be built economically, as little more was required than a front and one or more side walls, enclosing a space of the ledge-floor and roofed by the overhanging rock. Such single houses were often found occupying niches hundreds of feet above the valley-floor. In several places, however, the recesses, or shallow caves, were of sufficient length and depth to accommodate a large number of houses, forming a real village, with granaries, kivas and protective front walls. The most extensive of these towns yet known is that in Walnut Canyon, a tributary of Montezuma Creek, Colorado, called Cliff-Palace. This contained about 100 rooms. The terrace had been leveled and extended by building supporting walls along its irregular front, and long and prosperous occupancy is evident. This and another remarkable ruin nearby called Spruce Tree House, lately cleared of rubbish, are now national reservations and in the custody of the

Smithsonian Institution. Such reservations also ensure the continued safety of similar remains in various places elsewhere. See CASA GRANDE, etc.

The construction of these houses is described in the 'Handbook of American Indians' as follows:

"In the large shelters the buildings are much diversified in plan and elevation owing to the irregularities in the conformation of the floor and walls. The first floor was the rock-surface, or, if that was uneven, of clay and flagstones, and upper floors were constructed of poles set in the masonry, often projecting through the walls and overlaid with smaller poles and willows, finished above with adobe cement. The masonry is excellent, the rather small stones, gathered in many cases from distant sites, being laid in mortar. The stones were rarely dressed, but were carefully selected, so that the wall-surface was even, and in some cases a decorative effect was given by alternating layers of larger and smaller pieces and by chinking the crevices with spalls. The walls were sometimes plastered inside and out and finished with clay paint. The doorways were small and squarish, and often did not extend to the floor, except an opening or square notch in the centre for the passage of the feet. The lintels were stone slabs, or consisted of sticks or small timbers. Windows or outlook-apertures, were numerous and generally small. . . . Where the way is very steep niche-stairways were cut in the rock-face, making approach possible. Ladders of notched logs were also used."

In some parts of this district, as, especially on the eastern side of the Jemez Plateau, in New Mexico, great numbers of dwelling-places have been dug out of the rock, or crevices have been enlarged and the front walled up. Arizona and Mexico show these also. They are associated with the cliff-houses, but are more properly classified and described elsewhere. See CAVE-DWELLERS.

The age of these ruins, by whom built, and when and why they were abandoned, are matters of conjecture, with few substantial bases for hypothesis. They certainly antedate the coming of white men, for no objects of metal nor any evidences of domestic animals have been found. Estimates as to antiquity vary from 500 to several thousand years — the latter probably very excessive. Many places have evidently been occupied within comparatively recent times, and 1,000 years seems enough to allow to the oldest. The best opinion is that pressure by enemies led to the making of these inconvenient habitations, and that this with the increasing dryness of the climate (of which other evidence exists) finally compelled retreat. Speaking of the Mesa Verde district, Dr. J. Walter Fewkes, of the bureau of ethnology, who is perhaps the best informed man in the country on this subject, expresses the subjoined opinion:

"The inhabitants of these buildings struggled to gain a livelihood against their unfavorable environment until a too exacting nature finally overcame them. . . . One of the primary reasons was change of climate, which caused the water-supply to diminish and the crops to fail; but long before its final desertion many clans abandoned the place and drifting from point to point sought home-sites where water was more abundant. . . . Where the descendants of Cliff Palace now dwell, or whether they are now extinct, can be determined only by additional research."

Bibliography.— Annual Reports United States Geological Survey (Hayden's, 1874, 1876); Reports Bureau of Ethnology, and Bulletins, especially Nos. 30, 41, 50, 51; Hodge, 'Handbook of American Indians' (Washington 1907); Nordenskiold, 'Cliff-dwellers of the Mesa Verde' (Stockholm 1893).

ERNEST INGERSOLL.

CLIFF SWALLOW, a swallow of North America, also known as the eaves swallow, which makes its nest about barns and outbuildings. It has a white forehead, a gray breast and collar and a square tail. Its nest is always placed on the outside of the building, unlike that of the fork-tailed barn swallow. Before the country was settled these birds nested in colonies on the sides of cliffs. Its nests in these situations were globular with a narrow neck. With the advent of civilization the birds abandoned the cliffs and began to build their nests in the better-sheltered spaces under the eaves of houses and barns. Their nests have also in some cases lost their flask-like form, now being mostly in the shape of a cup. Consult Knowlton, 'Birds of the World' (New York 1909).

CLIFFORD, the name of a very old English family and barony, taken from the village of Clifford in Herefordshire, although the family was mainly associated with the north of England. The founder of the family, Walter, son of Richard Fitz-Ponce, a Norman baron, acquired the castle of Clifford, in Herefordshire, under Henry II, and hence took the name of Clifford. Among the noted members of this family were ROBERT DE CLIFFORD, a prominent soldier during the reigns of Edward I and II; JOHN, the 9th baron, who fought on the side of Henry VI and is celebrated by Shakespeare in 'King Henry VI'; RICHARD, bishop of Worcester and London; HENRY, 10th baron, a student of astronomy and astrology who is celebrated by Wordsworth in 'The White Doe of Rylstone.' In 1525 the Cliffords became earls of Cumberland, but in 1643 this title became extinct. The male line of the Cliffords is at present represented by the baronial family Clifford of Chudleigh. The first Baron Clifford of Chudleigh was Thomas Clifford, one of the members of the Cabal, who was raised to this dignity in 1672. Consult Cokayne, 'Complete Peerage' (1887–98).

CLIFFORD, Cornelius, American clergyman: b. New York, 24 Aug. 1859. He was educated at Saint John's College, Fordham, and in the Jesuit scholasticates of Woodstock, Md., Innsbruck, Austria, and Saint Asaph, Wales, and at Louvain University. He entered the Society of Jesus about 1885; was professor of rhetoric at Georgetown University 1887–89, and Saint Francis Xavier's College, New York, 1889–90. He was transferred to England in 1892 and was headmaster of the senior school at Wimbledon 1895–97. He was ordained to the priesthood in 1898 and in 1898–99 was at Beaumont College, Old Windsor. He quitted the Society of Jesus in 1899 and was appointed professor of logic and history at Merriam Park

College, Saint Paul, Minn. In 1900–03 he edited the *Providence Visitor* and in 1905–07 was an assistant in the Assumption Church, Morristown, N. J. The two years following he taught philosophy and Church history at Seton Hall College, New Jersey, becoming in 1909 pastor of a church at Whippany, N. J. Since 1913 he has lectured on scholastic philosophy to candidates for the M.A. and Ph.D. degrees at Columbia University. He is the author of 'Introibo' (1903); 'The Burden of the Time' (1904). He is a contributor to the 'Catholic Encyclopedia' (1910), the *Month, Tablet, Spectator* (London), etc.

CLIFFORD, George, EARL OF CUMBERLAND: b. Westmoreland 1558; d. 1605. A celebrated English navigator. He studied at Cambridge, where he received the degree of M.A. in 1576. He had become Earl of Cumberland in 1570. In 1588 he was placed in command of the *Elizabeth Bonaventure* and fought the Spanish Armada. He was notorious as a buccaneer and captured many valuable prizes.

CLIFFORD, Harry Ellsworth, American electrical engineer: b. Lowell, Mass., 21 April 1866. He was graduated at the Massachusetts Institute of Technology in 1886, and spent three years as a graduate student at Harvard. In 1886–88 he was assistant in physics, instructor in theoretical physics 1888–95, assistant professor of theoretical physics 1895–1902, associate professor of theoretical electricity in 1902–04 and professor of theoretical and applied electricity in 1904–09 at the Massachusetts Institute of Technology. In the latter year he was appointed professor of electrical engineering at Harvard University. He also engages in a consulting practice.

CLIFFORD, SIR Hugh, English colonial administrator and civil servant: b. London, 5 March 1866. He entered the Malay States civil service in 1883 and was British resident at Pahang (1896–99), colonial secretary of Trinidad (1903–07) and of Ceylon (1907–12); governor of the Gold Coast Colony since 1912. He was created K.C.M.G. in 1909. He has published 'In Court and Kampong' (1897); 'Studies in Brown Humanity' (1898); 'In a Corner of Asia' (1899); 'Bushwhacking' (1901); and is joint author with Sir Frank Swettenham of a 'Dictionary of the Malay Language'; 'Further India' (1904); 'Heroes of Exile' (1906); 'The Downfall of the Gods' (1911); 'Malayan Monochromes' (1913); 'The Farther Side of Silence' (1916).

CLIFFORD, John, English Baptist clergyman: b. Sawley, Derbyshire, 16 Oct. 1836. He was educated at the Baptist College, Nottingham, University College, London. He was minister of the Praed Street and Westbourne Park churches, London (1858–1915). He was president of the London Baptist Association (1879), of the Baptist Union (1888 and 1889) and of the Baptist World Alliance (1905–11), of the British Chautauqua (1899–1900). He has received degrees from several colleges as well as that of D.D. from Bates College, Lewiston, Me. Dr. Clifford has been for many years the acknowledged leader, not only of the Baptist community, but of a militant Union family in England. He organized the "passive resistance" movement against the English Education Act of 1902, which largely contributed to the overthrow of the Unionist government in 1906. He was editor of the *Baptist Magazine* (1870–83) and has published 'Familiar Talks with the Young' (1872); 'Is Life Worth Living?' (1880); 'Daily Strength for Daily Living' (1885); 'The Dawn of Manhood' (1886); 'The Inspiration and Authority of the Bible' (1892); 'The Christian Certainties' (1893); 'Typical Christian Leaders' (1898); 'God's Greater Britain' (1899); 'The Secret of Jesus' (1904); 'Ultimate Problems of Christianity' (1906); 'Gospel of Gladness' (1912); 'State Education after the War' (1916); 'The Spirit of Man in 1916' (1917).

CLIFFORD, Lucy Lane, English novelist, married to William Kingdon Clifford (q.v.) 1875, after whose death in 1879 she turned to literature for support. Her writings, some of which are notably original and striking, include 'Very Short Stories' (1882); 'Mrs. Keith's Crime' (1885); 'Love Letters of a Worldly Woman,' which attracted much attention (1891); 'The Last Touches' (1893); 'Aunt Anne' (1893); 'A Flash of Summer' (1895); 'Mere Stories' (1896); 'A Woman Alone' (1901); 'Woodside Farm' (1902); 'The Getting Well of Dorothy' (1904); 'The Modern Way' (1906); 'Sir George's Objections' (1910); and the plays 'The Likeness of the Night' (1900); 'A Long Duel' (1901); 'A Supreme Moment' (1902); 'The Searchlight' (1903); 'Hamilton's Second Marriage' (1907); 'The Latch' (1908).

CLIFFORD, Nathan, American jurist: b. Rumney, N. H., 18 Aug. 1803; d. Cornish, Me., 25 July 1881. Through his own efforts he obtained a common school and academic education, studied law and began practice in York County, Me., 1827. He was a member of the State legislature, 1830–34; speaker of the House, 1833, and attorney-general of the State, 1834–38. He served two terms as representative in Congress, 1839–43, advocated Van Buren's re-election, took part in public discussions with the leading Whig orators and established a reputation as one of the most eloquent of Democratic champions. He was United States Attorney-General under President Polk, and a special commissioner to Mexico to arrange terms of peace between that country and the United States, and he negotiated the treaty which secured California as a part of the United States. He resumed law practice in Portland, Me., 1849, and won an enviable reputation for forensic ability. In January 1858 President Buchanan appointed him associate judge of the United States Supreme Court. As the oldest associate judge in 1877, he presided over the electoral commission, conducting its proceedings with noteworthy impartiality, though a firm believer in Tilden's election. He published 'United States Circuit Court Reports' (2 vols., 1869).

CLIFFORD, William Kingdon, English mathematician: b. Exeter, 4 May 1845; d. Madeira, 3 March 1879. Educated in his native city and at King's College, London, he proceeded to Trinity College, Cambridge, where he graduated in 1867 as second wrangler. In 1871 he was appointed professor of applied mathematics at University College, London, a post which he held till his death. In mathematics his teachings and writings are regarded as marking an epoch in the history of the science in England. His ‘Canonical Dissection of a Riemann's Surface,’ his theory of ‘Biquaternions’ and his memoir ‘On the Classification of Loci’ may be mentioned as his most important contributions to this subject. He also wrote on philosophical subjects. Among his works the most important are ‘Elements of Dynamics’ (Vol. I on ‘Kinematic,’ 1878); ‘Seeing and Thinking’ (1879); and ‘Common Sense of the Exact Sciences’ (1885, completed by Karl Pearson). In 1882 appeared a collection of his ‘Mathematical Papers’ and in 1879 his ‘Lectures and Essays.’

CLIFFSIDE, N. J., borough of Bergen County, on the Hudson River, opposite New York city, with which it has ferry connection. It is mostly a residential suburb of the cities of New York, Jersey City and Hoboken. Pop. 3,395.

CLIFTON, Ariz., city and county-seat of Graham County, 120 miles northeast of Bisbee, on the San Francisco River, and on the Arizona and New Mexico, the Morenci Southern and other railroads. Copper mining and stock raising are the principal industries. Division offices of the Arizona and New Mexico Railroad are located here. Pop. 4,874.

CLIFTON, England, popular watering-place of Gloucester County. It is a suburb of Bristol situated within the city boundary, on the summit of lofty cliffs, whence its name. A suspension bridge 703 feet long here crosses the river Avon 245 feet above its bed. Clifton contains many handsome residences but neither trade nor manufactures. It is known for its hot mineral springs. Clifton College, founded in 1862, takes high rank as an educational institution.

CLIFTON FORGE, Va., city in Allegheny County, 190 miles northwest of Richmond, on the Chesapeake and Ohio Railroad. It contains railroad repair shops, foundries and machine shops, flour mills, an ice-cream factory and planing mills. Iron ore and limestone are found near by. The city owns the waterworks. Pop. 5,748.

CLIFTON HEIGHTS, Pa., borough in Delaware County, six miles southwest of Philadelphia, on the Darby River, and on the Philadelphia, Baltimore and Washington Railroad. It has manufactories of woolen and cotton goods, towels and hosiery. It contains also a public library. Pop. 3,155.

CLIFTON SPRINGS, N. Y., summer and health resort in Ontario County, about 28 miles southeast of Rochester, on the New York Central and Lehigh Valley railroads, famous for its sulphur springs. It contains the Clifton Springs Sanitarium, the latter surrounded by three parks. There are manufactories of pumps, insect sprayers, automobiles, bicycles and tinware. Settled about 1850, Clifton Springs was incorporated as a village in 1859. The waterworks and electric light plant are owned by the municipality. Pop. 1,600.

CLIMACTERIC (*annus climactericus*), a critical year or period in human life wherein, according to astrologers, there is some notable alteration to happen in the body and a person is exposed to great danger of death. The word comes from *κλιμακτῆς*, the step of a ladder or stair. The first climacteric is, according to some, the seventh year; the others are multiples of the first, as 14, 21, etc.; 63 and 84 are called the grand climacterics and the dangers attending these periods are supposed to be great. Some held, according to this doctrine, every seventh year a climacteric; others allowed this title only to the product of the multiplication of the climacterical space by an odd number, as 3, 5, 7, 9; others considered every ninth year as a climacteric. The idea of climacterics is very ancient and has purely symbolic, i.e. psychological, significance. The notion of seven-year changes as real, apart from such unconscious psychological symbolizations, is an error.

CLIMATE (Gr. *κλίμα*, «a slope or inclination»). The term was used to denote the effect of the oblique rays of the sun on the temperature of the earth and its atmosphere. To-day it is applied to the sum of the atmospheric conditions as recorded for a long period of time; or, in other words, it is the totality of weather, while «weather» is the physical condition of the atmosphere at a given time or during a limited period.

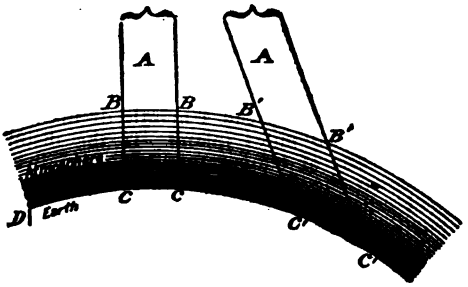
One may well speak of the weather to-day, or of last month, or of some past year; but not of the climate of a day, a month or a year. The climate of a place is what may be expected to occur as the result of a study of its continuous weather records for a long period of years — the atmospheric pressure, the temperature, the rainfall and snowfall, the time and frequency of frost, the extremes of heat and cold, the direction and velocity of the wind, the amount of air that flows from the different points of the compass, the amount and intensity of sunshine, the humidity and transparency of the atmosphere and its electrification.

The study of the causes of the weather and of the laws of storms constitutes that branch of science known as meteorology; climatology is to be considered as a subdivision of meteorology.

Climates may be broadly divided into marine, continental, mountain and plain with the many variations produced as these conditions gradually or precipitately shade off the one into the other.

Basis of Climate.— If the axis of the earth's rotation were perpendicular to the ecliptic (the plane of its orbit) there would no seasonal changes, for the rays of the sun would fall upon every point on a parallel of latitude with the same angle of incidence on each day of the year. There would be but one season at any place and it would never end; and there would be little variation in the intensity of storms. But as the axis of the earth is inclined at an angle of 23.5° to the plane of its orbit and as the direction toward which it points remains nearly constant, there are but two days in each year when both hemispheres (north and south) are exactly one-half in sunshine and one-half in darkness, that is, at the vernal and autumnal equinoxes, when the sun crosses the equator. At all other times in each hemisphere the angle at which the sun's rays strike the earth, the depth of the air through which they pass, the length of the day and the proportions of each hemisphere immersed in sunlight, are increasing or decreasing. As the two latter conditions increase in the northern hemisphere after the vernal equinox the summer grows upon us, reaching its greatest degree of heat about four weeks after the summer solstice. The lag of temperature is due to the fact that the atmosphere, being heated much more by radiation from the earth than by the direct action of the solar rays, does not attain its greatest heat until after the land and water have reached their maximum temperature and in turn have communicated this heat to the air above. Up to 21 June, or the summer solstice, the northern hemisphere receives each day more heat than it loses, otherwise it could not gain in temperature; after the solstice the sun each day at meridian is found to have receded a little to the south. At places north of the tropic of Cancer its rays fall with increasing obliquity and pass through a greater depth of air and impinge for a less time each day, so that within a few weeks the earth begins to radiate more heat each day than it receives. The maximum heat of summer occurs, on the average, when the loss of heat from the earth is just equal to that gained during the day from the sun. This, as previously stated, occurs several weeks after the sun is well on its way southward. About 21 September the autumnal equinox occurs, when the sun crosses the equator, and, as at 21 March, the days are of equal length at all latitudes of both hemispheres. On or about 21 December — the winter solstice — the sun is farthest south and the same conditions prevail in the southern hemisphere that prevailed in the northern hemisphere on 21 June. North of the equator the sun is now least effective; its rays reach the earth at the lowest angle through the greatest depth of air and they are operative for the fewest hours during each day, of any portion of the year, but the greatest cold does not occur. This comes about four weeks later, when the increasing heat received each day by the earth from the sun is just equal to that lost by radiation.

The effect of latitude will be understood by reference to the following figure:



As the latitude increases, the rays of the sun will fall with increasing obliquity, and they lose in power by being spread over a larger surface, and by traversing a greater depth of air, which absorbs more of their heat. The same beam A, “when the sun is vertical, is spread over a surface such as CC. When the sun is inclined at an angle as shown in the figure the beam is spread over a surface, $C'\,C'$, which is somewhat greater than the first, and it passes through a column of air $B'\,B'\,C'\,C'$, greater than that of $BBCC$. The intensity of insolation at midday decreases approximately as the cosine of the latitude.”

Near the equator the sun's rays at midday fall perpendicular to the surface of the earth, and there is virtually no change in the length of the day and consequently there is little variation in the daily or seasonal temperature. As the variation in the length of the day increases with the latitude, there are regions, in the temperate zone, where the length of time that the sun's rays falls upon the earth each day more than compensates for their obliquity. On this account the interior of continents may have at midday a higher temperature than prevails at the equator.

Solar energy is about 7 per cent greater at perihelion (the point in the earth's orbit nearest the sun) than at aphelion (the point farthest away). As perihelion occurs in December, or the summer time of the southern hemispere, and aphelion in its winter, that region has a greater annual range in the intensity of solar insolation than the northern hemisphere. If the land surfaces of the two hemispheres were equal in area, the southern would have colder winters and warmer summers than the northern and this is the case in portions of the southern hemisphere where the land area is large. But the great capacity of water for heat and the slowness with which it radiates the same, modifies seasonal extremes that otherwise would be much greater.

Variations in Climates.— If the earth were all water or all land and if the land were everywhere of the same elevation, most of the factors that cause variations in climates — often considerable for regions closely contiguous — would be eliminated from the equation. Every point on the same parallel of latitude would have the same mean annual temperature and the same average heat in summer and the same average cold in winter. New York and London, separated by 11 degrees of latitude, would not, as now, have about the same mean annual temperature. If it were all water, there would be no such extremes of heat and cold as we now know. It is probable that a thermometer exposed in shade four feet from the surface of the earth would not anywhere — even at the equator — ever register above 90° F.; there would be no frost within 35° or 40° of the equator, and zero temperatures would be recorded only in regions within 30° of the poles. If it were all land the heat would be much more intense than now in the tropics and in the temperate and frigid zones the heat of summer and the cold of winter would reach extremes unknown at this time.

All the anomalies of climates are caused by the different specific heat capacities of land and water; their different powers of conduction and radiation; the irregular distribution of these two surfaces; the widely-varying elevations of the land; the trend of mountain ranges; the prevailing direction of the winds, and the carrying of large quantities of heat by ocean currents from the equator toward the poles and the relative quantities of cloud and rain or snow. It is germane to a proper understanding of climate to know something in detail of the manner in which the air is heated. At 100 or 200 miles above the earth's surface there is only the hypothetical ether, which, while too tenuous to be detected or measured by any methods or appliances so far known, is supposed to be the medium that transmits solar energy to the earth and diffuses it through space. This energy, coming in many different wave-lengths and with widely varying intensities of vibration, produces several different phenomena as it is absorbed by or passes through the air, or as it impinges on the surface of the earth. The waves differ in their effects on different objects, depending on the length and the absorptive response of the substances upon which they fall. The waves have heating, lighting and chemical effects simultaneously in themselves and it is only the nature of the objects upon which they fall that tends to differentiate them. The atmosphere, even at the surface of the earth, absorbs but a small part of the heat-waves. They therefore reach the earth and warm its surface; and the earth in turn, by radiation, convection and conduction sends back into the air long heat-waves, which, unlike the shorter solar waves, are readily absorbed by the atmosphere. The atmosphere is thus mainly warmed from the bottom upward. This accounts for the perpetual freezing temperatures of very high mountain peaks, although they are nearer the sun than are the bases from which they rise. At the height of one mile in free air the temperature is about the same at midday as at midnight. Only during recent years have we begun to realize how extremely thin is the stratum of air next the earth that has sufficient heat for the inception, growth and maturity of both animal and vegetable life. The raising of the thermometer shelter at the New York city observatory from an elevation of 150 feet above the street to an elevation of 300 feet has caused an apparent lowering of the mean annual temperature of 2.5° F. On the hottest day in summer, if one could be lifted up to a height of only 1,000 feet in free air, he would find a marked change in temperature. The United States Weather Bureau at 16 stations made a total of over 1,200 kite observations in the United States in 1897. They showed an average decrease of 7.4° F. for the first 1,000 feet of ascent during the warm months and when the observations were taken near the hour of daily maximum heat the decrease was frequently as much as 15°. At the height of six miles the cirrus clouds common to this level are, on account of the low temperature, always composed of minute ice spiculæ, never of watery droplets like the lower cumulus clouds. In the middle latitudes of both hemispheres the air at this height is ceaselessly flowing toward the east, passing uninterruptedly over the cyclonic and anti-cyclonic systems that cause our storms and cold waves at the surface of the earth. Glaisher and an assistant ascended to a height of about 30,000 feet. They suffered greatly from the cold, which measured many degrees below zero although the time of year was 5 September. At the height of six miles the average temperature, determined by many balloon ascensions, is about — 50° F.

The difference between continental and marine climates is marked. The same amount of heat will raise the temperature of a land surface four times as high as it will raise that of a water surface. Land is a good absorber and a good radiator, but it is a poor conductor and a poor reflector. The absorbed heat does not penetrate into the ground to any great depth. The land, therefore, retains its absorbed heat near the surface and quickly and freely radiates that which it has absorbed. These conditions give to large land surfaces much higher temperature during the day and much lower temperature during the night, than obtain over a water surface of the same latitude and much colder winters and much warmer summers. As an illustration, it may be stated that the Bermuda Islands, in the North Atlantic Ocean, have a mean daily range of temperature of only 10° F., and an annual range of only about 50°; while Memphis, Tenn., near the same latitude, in the interior of a large continent, has a daily range of 17° and an annual range of 112°. At Memphis a temperature of 104° has been recorded in summer and — 8° in winter. At Bermuda the temperature generally reaches 90° during the summer, but very rarely exceeds that figure, while temperatures below 45° are also infrequent. The two places are typical of continental and of marine climates. All regions bordering closely on the sea partake of both climates, the predominating one being determined by the direction in which the coasts trend, their elevation and the direction and force of the prevailing winds.

In the middle latitudes of both hemispheres the prevailing winds are from the west, and therefore continents lying in these regions have a marine climate in their western coastal regions, where the air moves from the water to the land, and nearly continental climate in their eastern coastal regions, where the general movement of the air is from the land to the sea.

The distance to which moist and equable air conditions extend inland is determined by the elevation of the land and its trend relative to the incident winds, and the proximity of mountain ranges. The humid air from the Pacific meets the lofty range that skirts the western shore line of both North and South America; it is forced up the mountain side until the cold of elevation and the cooling of the air by expansion as it ascends cause it to precipitate its moisture mostly upon the western side of the mountain, and it passes to the interior of the continent bereft of that life-giving moisture which, were it not for the intervention of the mountains, would spread a mantle of luxuriant vegetation 1,000 miles inland. If the disintegrating effects of temperature and rainfall had worn down the Sierras, the Plateau, and the rugged crags of the Rocky Mountains to the height of the Appalachians, the vaporous atmosphere of the Pacific would flow eastward far more freely than now, and meet that which, by the convectional action of cyclones, is frequently carried from the Atlantic Ocean and the Gulf of Mexico inland to the Mississippi Valley; then rain would be more abundant and the whole of the United States would have arable land.

The specific heat of water is greater than that of almost any other substance. It requires 10 times the quantity of heat to raise a pound of water one degree that it does to raise a pound of iron one degree. Solar rays penetrate the sea to a considerable depth; they are quite uniformly absorbed by the stratum penetrated. In consequence of these laws and conditions a vast quantity of heat is stored by the ocean in the tropics and slowly given to the air as the ocean currents carry the warm water toward the poles. In this connection the writer would correct what he believes to be an exaggerated popular idea relative to the effect of the Gulf Stream on the climate of Europe. The North Atlantic circulation, flowing northward on the western side of the ocean (except a southward current from Davis Strait that chills Labrador and somewhat affects the temperature of the New England coast), and southward along the coast of Europe, is many times more effective in modifying climate than is the Gulf Stream. That the western part of Europe is warmer, more humid and subject to less radical changes in temperature than equal latitudes in North America, except on the Pacific Coast, is due primarily to the great ocean that lies on the west of Europe. Without ocean currents of any description, this body of water would give to the air that moves from it to Europe a more equable temperature than is possessed by the eastern part of the North American continent. Continents, therefore, partake largely of marine climates on their western borders, and principally of continental climates on their eastern borders.

Climate affects the health, happiness and well-being of people more than any other condition that goes to make up their environment. Within the broad confines of the United States there are many, but not all, shades and varieties of climate. One of the questions most frequently asked is, "Where shall I find a climate possessing both dryness and equability of temperature?" To this interrogatory reply must be made that the ideal climate as regards equability of temperature and absence of moisture does not exist in the United States, but that the nearest approach to it will be found in the great Southwest.

The temperature of the Southwest is not equable in the sense of having an extremely small daily range, but it possesses the quality of annual uniformity in a greater degree than will generally be found elsewhere except on the seacoast, and there the humidity is great.

The most equable temperature on the globe will be found on the high table-lands and plateaus of the tropics. Santa Fé de Bogota, in the United States of Colombia, has an average temperature of about 59° F. for all months of the year, and the range for the entire year is less than is often experienced in a single day in some parts of the middle latitudes. But while the ideal temperature may be found on the higher elevations of the tropics, the rainfall is much greater and more continuous than in this country.

The temperature of a place depends chiefly on three conditions,— latitude, elevation and contiguity to large bodies of water. At sea-level in the tropics extreme conditions of heat and moisture produce great physical discomfort. But even under the equator it is possible to escape the tropical heat of low levels by ascending from 4,000 to 6,000 feet. In the economy of nature there is a certain limit beyond which the two extremes, dryness and equability of temperature, cannot coexist; thus we may find a region so deficient in moisture as to satisfy the requirements of the case, but the very lack of moisture is a condition that facilitates radiation and thus contributes to great extremes of temperature. Regions may be found, as on the lower Nile, where there is a lack of rainfall coupled with a high and moderately uniform temperature. The mean winter temperature of Cairo, Egypt, is 56° F.; mean summer temperature, 83°; a range from winter to summer of 27°. The mean winter temperature of Phœnix, Ariz., is 52°; mean summer temperature, 87°; a range of 35°. It is by no means difficult to find a counterpart of the far-famed Egyptian climate in the great Southwest.

The dryness of the air and the clearness of the sky are the conditions upon which daily ranges of temperature depend; the greater these, the greater the range of temperature from day to night. While a high summer temperature is characteristic of the Southwest and other portions of the Rocky Mountain plateau, it is a fact that the sensation of heat as experienced by animal life there is not accurately measured by the ordinary thermometer. The sensation of temperature which we usually refer to the condition of the atmosphere depends not only on the temperature of the air, but also on its dryness and the velocity of the wind. The human organism, when perspiring freely, evaporates the moisture of its surface to the dry air of the interior arid regions, and thus lowers its temperature and prevents sunstroke, which, in the more humid regions from the Mississippi Valley eastward, occur in great number with the air temperature much less than obtains in the West.

The meteorological instrument that registers the temperature of evaporation, and thus in some measure the actual heat felt by the human body, is the wet-bulb thermometer. The latter, as indicated by its name, is simply an ordinary mercurial thermometer whose bulb is wetted with water at the time of observation.

Effect of Climate on the Races.— Climate is the most potent of any factor in the environment of races. It is climate and soil, plus heredity and form of government, that produce either vigorous or weak peoples. In this respect the United States is unexcelled by any other region of the world.

Climate, soil and good heredity may produce a race large of stature and of great physical endurance, but unless such a people exists under a liberal form of government, in which public education is fostered and the arts and sciences taught, it is unable to employ its strength in those lucrative vocations that give a high per capita of wealth. It is weak in defending itself, either in war or in commerce, against a people of less numerical strength that is liberally educated, skilled and humanely governed.

If we consider the invigorating effect of cold air alone we might expect to find the strongest peoples inside of the Arctic Circle; and if we consider fruitfulness of soil alone we might reasonably expect to find the dominant peoples in the tropics. But the fact is that the greatest human potentiality occurs somewhere between these two extremes. The boundaries cannot be accurately determined by the naming of certain parallels of latitude, but a close approximation is made to the truth in the statement that the most vigorous people physically and the most resourceful mentally will be found in the regions that produce an abundance of cereal crops.

It is probable that much of the activity that has caused the United States to take such a commanding place in the world is caused by the invigorating effect of the cold, dry, highly electrified air of the North American cold wave. These winds have a much greater specific gravity than warm and humid winds, and this condition, added to the force with which they come, scatter and diffuse the befouled air near the surface of the earth. Enough has been said to indicate that climate is nearly as important a part of the environment of animal life as it is of the vegetable existence, and that a considerable range of annual temperature, if it be not so great as to limit the production of cereal crops, favors the development of strong races of men.

Elsworth Huntington, of Yale, has investigated the effects of weather and climate on the efficiency of several thousand factory workers in New England, Pittsburgh, North Carolina, Georgia and Florida, covering a period of four years, and for one year of some 1,700 students at Annapolis and West Point. He found that in the performance of skilled labor or in intellectual activity the greatest efficiency was neither in the coldest months nor in the warmest months; neither on the coldest days, nor the warmest days, but in the fall and spring, and on days of moderate temperature and considerable diurnal range. It appears that physical energy and mental acumen are least in mid-winter, and less in severely cold winters than in mild ones; that there is a second minimum of human energy in midsummer, which is less when the summers are abnormally hot than when they are cool. As his investigations proceeded southward he found the relation of efficiency to the seasons to gradually undergo a change, until in Florida the conditions were exactly reversed, the greatest efficiency occurring in winter and the least in summer. The long, warm, humid summers and the late spring and early fall were enervating, while the short winter, instead of being cold enough to be depleting to the vital powers, was stimulating. The totality of human energy for the year was greater in the North than in the South.

It was found that people are physically most active when the average temperature of the day is 60° to 65°, that is, when the noon temperature rises to about 70°. Mental activity reaches a maximum when the average temperature for the day is 38°, that is, when there are mild frosts at night. People do not work so well when the temperature remains constant, nor do they when the changes are excessive. The ideal conditions are moderate changes at frequent intervals. With an average temperature of 65° to 70° a relative humidity of about 60 per cent is desirable. The relative humidity of places of habitation in winter is usually not over half the latter amount.

Change of Climate.— For long it has been the opinion of meteorologists that there has been no change in climate during the period of authentic history; that the vast changes that have occurred during geologic periods have been accomplished by slow mutations covering thousands of years before the accumulated changes were measurable and apparent. But evidence is now multiplying that these views will need to be modified. The records left by moraines, the changing shores of inland seas and the thickness of the annual rings of the sequoia trees, which live for several thousand years, strongly indicate that since the last glacial period, of which there have been at least several, there have occurred climatic oscillations measurable by only a few thousand years and others whose span would come within one to several hundred years. Gradually geologists have unraveled the skein of glacial tracings and perceived that the ice periods consisted of at least four epochs separated by interglacial epochs, during which the climate became mild as at present, or even milder. Then evidence was found of other glacial periods farther back in geologic time, also divided into epochs. In certain regions vast sheets of ice spread southward to the southern part of the temperate zone, while at other times tropical conditions existed as far north as Greenland. The record wrought by the last ice age shows that the melting of the ice sheet did not progress uniformly. Several times the melting ceased and the climate seemed to return to glacial conditions, but these changes were minor in comparison to the great pulsations of climate that caused the vast ice sheets. There are other evidences that there have been changes of climate other than the slow mutation between glacial periods. A study of the abandoned strands of inland seas yields strong evidence that the waters did not fall regularly, but in irregular periods of wet and dry times which were measured by hundreds of years rather than by thousands. Huntington, whose valuable studies and researches have been long-continued and in many parts of the world, believes that during the past 20,000 or 30,000 years the climate of the earth has been subject to a great number of small changes, just as during the immense lapse of geological times it has been subject to a less though considerable number of great changes, each of which in turn seems to have been diversified by many minor variations. But this does not mean that there have been changes that are appreciable during the period of an individual life, as many believe who have not made a careful comparison of meteorological records.

Certain it is that the advance students of to-day are turning to the sun and studying variations in its radiations and other forms of activities with the hope of solving the problems of changing climate and the initiation and continuance of storms. The writer agrees with those who believe that variations in the number and magnitude of sunspots, prominences and faculæ are not the cause of variations in terrestrial weather and climate but are themselves the effects of the same solar cause that effects earth conditions.

Effect of Forests on Climate.— It is often said that the climate of a place depends largely upon the extent and proximity of wooded areas; that the number of rainy days and the amount of rainfall are modified by change of forest extent and drouths and floods affected. It is certain that in some regions trees once grew more abundantly than at present. This, however, should not be taken as proof that a destruction of the forests has resulted in a decrease of rainfall. The forests have diminished — in some cases wholly disappeared — and it is also true that the precipitation is less; but this decrease of rainfall might better be regarded as the cause rather than as the result of the barren condition of the soil. There is no evidence that the forests were ever more extensive in Alaska and in other high altitude countries than they now are. Nevertheless, in these countries, just as in the arid regions of great continents, there is evidence of a long-period climatic change — a decrease of precipitation or an increase of temperature, or both — a change that cannot be due to deforestation.

Professor Humphreys, of the Weather Bureau, says: «These universal slow climatic changes that for thousands of years have been modifying the glaciers and changing the inland seas might very well have led to extensive forest destruction; but that it itself was the effect and the destruction of the trees the cause seems most unlikely.»

In the Lop Basin of Chinese Turkestan, Huntington found vast areas covered with the dead skeletons of trees. He says: «It has often been asserted that the destruction of forests has been the cause of the diminution in rainfall. In the Lop Basin the opposite appears to be the case; the supply of water has diminished, and therefore the forests have died.»

The late Prof. Cleveland Abbe says: «In this day and generation, the idea that forests either increase or diminish the quantity of rain that falls from the clouds is not worthy to be entertained by rational, intelligent men.»

Gages exposed over forests catch more rain than similar gages exposed at the same elevation over unwooded adjacent areas. This is due to the fact that the forests restrict the movement of the wind, and not to a difference in the precipitation.

The covering of tobacco plants with cheese cloth results in establishing a local climate which will continue so long as the cloth remains in position. Extremes of temperature, both heat and cold, are reduced, and the resulting climatic change produces a marked effect upon all vegetation grown under the artificial conditions. A rank vegetable growth may have a heavy frost deposited upon it, while the same character of soil that grew the vegetation immediately adjacent, at the same level, but covered with two inches of sand may receive no frost. This is due to the difference in specific heat of the two surfaces, the sand gaining a higher temperature during the day with the same insolation than the vegetation or the unsanded surface, and radiating heat at a greater rate during the cold hours of night, thus keeping at a higher temperature the air immediately next the ground.

The erection of a tent, of a barn, of a dwelling-house, of a village, or the growth of a great city, respectively, influence the local climate in proportion to the area that is covered, modified by the character of the materials used in the constructions, each different form of matter having a different coefficient of absorption, reflection and radiation. Likewise the vegetable covering of the earth may have a local appreciable effect. The flooding of an area, the cutting away of forests and the covering with sand may have either minute or considerable effects upon local climates in proportion to the magnitude of the areas affected; but this does not mean that there is any great difference in the climatic effect between a forest covering and one of bushes, of grass or of growing crops; and it does not signify that there is sufficient change in the thermal conditions, due to the activities of man, as to make an appreciable difference in the temperature at an altitude of 100 or 200 feet, or to effect the general climatic conditions, or to cause storms to be more frequent than formerly, or of greater severity, or to increase the amount of precipitation.

Rainfall records for 100 years in New England and 60 years in the Ohio Valley do not show any appreciable effect on rainfall as the forest areas have been changed to cultivated fields. The precipitation for the last half of each period is practically the same as for the first half, but the rain curve in both cases shows pronounced oscillations in periods that vary from 8 to 11 years.

Effect of Forests on Floods.— Until recent years it has been quite generally believed that the effect of forests on the movements of water was to diminish the frequency and intensity of floods and to maintain higher stream-flow during dry periods. But a careful study by eminent scientists of the history of floods in the principal rivers of Europe for the period covered by the past 200 to 500 years, of the run-off of the streams of Wisconsin by Prof. D. W. Mead, of the University of Wisconsin; of the streams in the Yellowstone Park and elsewhere in the Rocky Mountains by Chittenden; of the Missouri, Mississippi and Ohio rivers by army engineers; and of the rivers of the Ohio Valley by the writer; do not confirm this view. Opinons differ. Foresters and many geologists take the affirmative side of the question, while meteorologists and constructing hydraulic engineers generally take the view that the broken, permeable soil of seedtime, and the growing crops of summer and fall, each year, and the covering of bushes that quickly shades the ground when trees are cut, may be as potent as the forests themselves in the conservation of moisture and in the restricting of run off.

It is not clear how the planting of trees at the headwaters of streams can be effective in minimizing or controlling floods, as it requires only a superficial survey to show that of the various basins that catch precipitation and shunt it down into the valleys where it may accumulate and cause floods, only a minute area lies at the head-waters of streams. If it be granted that the planting of trees, or their preservation, reduces the destructiveness of floods, which it will not, then the trees must be placed where the flood waters fall in order to be effective, which is on the slopes and alluvial plains some distance from headwaters, and it is not practicable to turn these food-producing areas back to the wild forested condition without doing a direct and positive injury to humanity.

Climate and Animals.— The geographic distribution of animals is doubtless the outcome of definite laws — laws that stand in close relation with the past history of the earth through a large portion of geological time. What those laws are forms a subject of great importance in studies of evolution,— a subject, it may be remarked, entirely too great to be adequately treated in the present connection. Naturalists are generally of the opinion that all animals have been produced from those that preceded them by some process of slow transmutation or development, and that this modification of animal forms took place very slowly, as evidenced by the fact that the historical period of nearly 4,000 years has hardly produced any perceptible change in a single species. That marked changes in the climate of the earth have occurred during the remote past there can be no doubt, and that those changes left a marked impress upon the fauna of the globe there can also be no manner of doubt. The great northern ice sheet and the accompanying cold of the glacial period, if it did not cause the extermination of the receding fauna, doubtless led to its migration to more congenial climates.

The part played in the faunal distribution of the globe by the present climate seems to be indirect rather than direct, although there are many facts which seem to point to a direct relation. While it is true that the fur-bearing animals of the frozen north are generally to be found in Arctic regions, yet they send their representatives far into the temperate latitudes, and indeed into the borders of the regions inhabited by the more exclusively tropical species. On the other hand, the tiger, whose home is naturally associated with the hot districts of India and the Indian Archipelago, is equally at home in the elevated regions of the Caucasus and the Himalayas, where his footprints are not infrequently found impressed in fields of snow. Other groups of animals are more limited in their migrations. Some are so closely adapted to an arboreal life that they never stray far beyond the limits of forest vegetation, while others are so tolerant of climatic change that the limit of their possible range is conditioned only by the character and quantity of the food supply and the interposition of impassable physical barriers.

Climate and Plants.— The factors necessary to the development of plant life are light, heat, soil and moisture. The ideal conditions as regards these essentials do not usually obtain, or, if they do, multitudes of plants seek to take possession of the region, so that there is a continuous struggle for existence in which many more plants fail than succeed.

The climatic factors heat and moisture are combined in several ways in different parts of the globe, and these combinations give widely different vegetation; thus a maximum of heat and a minimum of water give desert conditions where only specially adapted plants can exist. If, on the other hand, a maximum of heat is combined with a maximum of water, the result will be vegetation such as exists only in the rainy tropics. The possible combinations of the two climatic factors are very numerous, as are also those of soil and the effects of animal life and human agencies. Yet the vegetation of the globe is susceptible of a fairly definite classification. Following Humboldt, and adopting such terms as express in a general manner the vegetation characteristic of each zone, we have the following classification:

ZONES OF	Average temperature
1. Palms and bananas	78°—82°
2. Tree-ferns and figs	73°—78°
3. Myrtles and laurels	68°—73°
4. Evergreens	60°—68°
5. Deciduous trees	48°—60°
6. Conifers	40°—48°
7. Lichens, saxifrages and dwarf shrubs	32°—40°
8. Lichens and mosses	32° and below

While in a general way these zones stretch around the world in wavy belts, somewhat as do the isotherms, similar belts may be found encircling mountain peaks and chains with increasing altitude above sea-level. Indeed it is possible to pass successively from tropic to arctic vegetation on a single mountain peak in the tropics.

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WILLIS L. MOORE,
Professor of Meteorology, George Washington University.

CLIMATE AND CLIMATIC SPECIES AND VARIETIES. Although a half century ago it was generally held that changes of climate have not profoundly affected organisms, yet the recent detailed study of variation has shown that climate and local influences have been the causes of origin of probably a very large number of the species contained in our museums and described in biological literature. Among insects, birds and mammals it has been estimated that from a third to a half of the known species are climatic or local species or varieties, or local races. As is well known, Americans born of foreign parentage are larger than their ancestors, whether English, Irish, Germans or French; and Boroditch has shown that the children of Americans of both sexes born in the United States are larger than those of foreign races. Certain modifications in the cephalic index have also been observed. This is generally attributable to difference in the climate of the Old and New Worlds, our American climate being drier, more changeable and stimulating than that of Europe. It appears that the introduced English sparrow has undergone a gradual modification since its introduction into this country about 40 years ago. Bumpus has critically examined over 1,700 eggs of this bird, one-half from England and the other half from Providence, R. I. It was found that the eggs of the American race or breed vary more than the European, that they are smaller and of a strikingly different shape, being more rounded and with a much greater amount of color variation. This is attributed by the author to a suspension of natural selection. However this may be, it belongs with the class of facts which show that the modification is primarily due to the change from one climate to another. Cockerell has found that a common European snail (*Helix nemoralis*), introduced into this country soon begins to present variations not known to exist in England, while of the introduced butterfly (*Pieris napi*), 12 American varieties, and of *P. rapæ* four varieties have appeared on American soil within the few years which have elapsed since their appearance and spread on this continent. Where different mammals are transported from temperate to tropical countries the wool tends to become replaced by hair, and other changes occur. The turkey does not vary in temperate regions, but when acclimated in India it degenerates in size, is incapable of rising on the wing, becomes black and the long pendulous appendages over the beak develop enormously. Cold has naturally the inverse effect; mammals transported to the north from the tropics become more or less woolly. As the result of the severe winters and the elevation of Angora in Asia Minor, the cats, shepherd dogs, goats and hares are clothed with a long fleece-like wool.

Islands present different climatic features from the mainland, being damper, etc., and hence the birds, reptiles and other animals present slight but constant differences from their allies and probable ancestors on the nearest continents. Not only that each group, as in the case of the Galapagos Islands, but even each island is tenanted by a distinct local variety of birds. This has also been noticed by Wallace in the East Indian Archipelago. The swallow-tail butterflies of islands tend to have shorter tails, and the outlines of the wings differ. Thus the local races become incipient species, and by being isolated are prevented from crossing with the original stock or species, and in this way geographical varieties or representative species are produced. When great changes have taken place in the topography, portions of land cut off from the continent, or continents become divided, species have arisen. Thus in the late Tertiary, Asia and America were continuous, but when Bering Strait was formed, the bison of this country and that of Europe (aurochs) became specialized, becoming different species. In this way multitudes of species have probably arisen over all parts of the world. See DISTRIBUTION OF LIVING MAMMALS; PLANT GEOGRAPHY.

CLIMATE IN THE TREATMENT OF DISEASE. The relation of climate to health and disease is a definite one and its varying conditions become more specifically available in prophylaxis and treatment as knowledge concerning them becomes more exact. Moreover, the genetic concept which is gaining prevalence, of a developed response of man to his environment, which determines his adaptation at all levels of his being psychical as well as physical introduces a very important element into the consideration of this relationship. The more accurate knowledge concerning the factors which enter into climate obviates the more general classifications of the past which assigned certain groups of diseases to the certain groups of climatic conditions for therapeutic effect. The more specific fitting of very definite and varying individual conditions to certain climatic elements and the avoidance of others as injurious includes also an intelligent utilization of certain climatic conditions available close at hand which in the past were passed over in ignorance of their advantages or of methods of appropriating them. All this has introduced a new economy into the climatic treatment of disease and is further indicative of more complete knowledge and control of environment in the light of individual need and capacity for adaptation toward the environment.

The chief objective features of climate relative to health are the chemical composition of the atmosphere, presence and proportion of gaseous constituents and presence or absence of septic solid particles; the mean or extremes of temperature; humidity; diathermancy or permeability to heat rays; intensity of light; electrical conditions; density and pressure of atmosphere; prevailing winds, their direction and velocity. The condition of the weather, that is, the particular manifestation of climatic conditions at certain times or periods, is also of practical importance in determining the availability on the part of the patient of the advantages of the general climate. The average number of fair, rainy or cloudy days and also the condition of the soil in regard to drainage or retention of the moisture are of such practical significance. Artificial conditions, likewise, must enter into the choice of a suitable climate, living conditions, comfortable accommodations, presence or absence of sanatoria or other facilities for medical attention.

The complexity of the human body and its functions realizes its best health and usefulness in a well-adjusted balance between work and rest. It is best suited therefore by a climate of a moderate degree of constant variation. For an invalid, however, special conditions must be sought adapted to his particular condition. Certain climates possess certain qualities which supply these definite requirements. Marine or ocean climates are characterized by their equability, not only in the daily range of temperature but throughout the seasons as well, the presence of a large body of water tending to equalize temperature, moisture, winds, etc. The temperature varies, however, of course, with the latitude. The humidity of ocean climates acts as a veil, as it were, which mitigates the fierce heat by day and gives up the heat at night to the air. Sea air is also impregnated with the vapors of salt, and perhaps those of iodine and bromine, and it is free from dust and bacteria. There is always abundance of ozone. The ocean climate has a sedative effect upon the nervous system and a stimulating, tonic effect upon appetite and digestion. It increases the body metabolism and conduces to sleep. Sea voyages are of value in certain conditions of mental exhaustion, also in certain chronic catarrhal and rheumatic conditions. They are of benefit also in scrofula, hay fever and asthma. Island climates, if the islands are not large, afford the advantages of a complete ocean climate. Coast climates are less equable because of the disturbing influences of increased land heat radiation. They are usually less humid, precipitation being more active. Winds are often an important factor in coast climates, hence a knowledge of the local conditions is essential to estimate correctly the qualities of any given coast climate in its variation from the perfect ocean climate.

Inland climates vary in temperature and humidity. As a rule they are drier than coast climates. This is modified, however, by the proximity of large bodies of water. The dry warm climate is of value to delicate or elderly people, or to those in a temporarily weakened state. It is also suitable for pulmonary tuberculosis in many cases, chronic bronchitis, rheumatism, cardiac and renal diseases. It is the climate of deserts such as of Egypt, the lower regions of Arizona and New Mexico and the pine belts of some of our States. It is rich in ozone, the air is pure, there is an abundance of light and warmth. Prevailing violent winds and the consequent presence of dust offer a disadvantage.

Dry and cold climates of low levels may be of advantage to certain persons with good resisting power, since to some individuals cold acts as a stimulant and tonic and increases carbon dioxide output. The climate of higher altitudes is dependent also upon the surrounding country and nearness to ocean or mountain ranges. Its advantages for tuberculosis lie in the purity of the air, greater opportunity for direct exposure to sunlight and its stimulation through quickened respiration and circulation to increase in red blood corpuscles. There is at the same time lessened proteid metabolism which therefore increases the storage in the tissues. The increased activity put upon the circulatory and respiratory organs makes such climate unsuitable in valvular disease of the heart and rapidly advancing pulmonary disease. Medium altitudes are usually chosen for sanatoria for tuberculosis. Many of these places, because of latitude and dryness of climate, afford most of the advantages of the higher altitudes. Tuberculosis of long standing with much expectoration seems to do best in a warmer atmosphere not too far from the sea, such as the climate of Egypt, or of Arizona.

Moderately moist and cold climates are not to be recommended therapeutically, though various resorts have certain advantages in opportunity for change, accessibility in being near large centres of population, and afford amusements, games, etc., with good regimen for those in need of rest. The moist, low, warm, inland climate is the poorest in therapeutic value. It is enervating, depressing and mosquito-ridden, hence malarious and noxious in many particulars.

Such a variety of climatic influences and effects serves principally to emphasize the individual difference of response. This is evident not only in the special disease complex which has been built up and seeks its peculiar relief; it lies also in the symbolic or psychic value which each climatic element in environment has to that particular individual in his expression of himself in relation to his surroundings and his success or failure attained thereby. Hence the problem becomes one not alone of better understanding of climatic conditions and the elements which constitute them, but far more in appreciating and knowing the meaning and value of individual effort toward adaptation expressed through health and disease and the part in this greater whole which the elements of climate play. This manifests itself in individual difference of response to the same climatic factors and in the difference in ability to extract from this portion of environment useful material for creative functional activity, which is health, or that imperfect compromise between environment and antagonistic individual tendencies which results in disease symptoms and finally death.

SMITH ELY JELLIFFE.

CLIMATOLOGY, CLIMATOGRAPHY. See CLIMATE.

CLIMAX (Gr. κλιμαξ, a ladder or stairs), a rhetorical figure in which a series of propositions or subjects are presented in such a way that the least impressive comes first, and there is a regular gradation from this to the most impressive or final; opposed to "anti-climax," in which the ideas are presented in the reverse order.

CLIMBING-FERN (*Schizæaceæ*), a family of ferns, mostly tropical. It contains 5 genera and 75 species, two of which are represented in eastern North America. One *Schizæa pusilla*, or curly grass, is a rare fern found in wet soil in the pine barrens of New Jersey and in Newfoundland and Nova Scotia. The other is the Hartford fern (*Lygodium palmatum*), occurring in moist thickets and open woods along the eastern seaboard of the United States from New Hampshire to Florida. The plant is a slender and flexible climber with palmate leaves, surmounted by a panicle of forked pinnules, making it a very desirable decorative house-plant.

CLIMBING-FISH, or **CLIMBING-PERCH,** a spiny-rayed fish (*Anabas scandens*) of the family *Anabantidæ* which, with the *Osphromenidæ*, constitute the sub-order *Labyrinthici*, characterized by the peculiar labyrinthine structure within the gill-cavity, formed of excessively delicate plates of bone covered in life by a moist membrane and enclosing air-spaces between them.

In the climbing-perch this organ is greatly developed above the gills, and extremely complex, and serves as an air-breathing organ of such great importance that the fish is able to live out of water for several days without distress, during which it regularly breathes air. When it returns to the water it uses its gills, so that it may be regarded as truly amphibian. This species is about eight inches long, and is found in shore waters of India, Burma, the Malay Islands and, according to Semper, in the Philippines. Its name was given to it by the Malays in reference to its alleged habit of climbing trees in search of insects upon which, and small mollusks, it feeds. They described it as scrambling up palm-trunks by means of the rough edges of its gill-covers and the spines of its hinder fins. Such a feat is possible, especially on a sloping trunk, for these fishes do creep about rocks and cross spaces of land, but recent naturalists have not seen any tree-climbing. Consult Semper, 'Animal Life' (Intern. Sci. Series, New York 1881).

CLIMBING PLANTS. See LIANAS.

CLINCH, Charles Powell, American poet and play-writer: b. New York, 20 Oct. 1797; d. there, 16 Dec. 1880. For many years he was editorial writer, and literary and dramatic critic for the press; also writer of many poems, theatrical addresses and dramas. In 1835 he was elected a member of the State legislature. Having lost his estates in the great New York fire, he obtained a place in the New York custom-house, where he became deputy and then assistant collector. Among his publications are 'The Spy'; 'The Expelled Collegiates'; and 'The First of May.'

CLINCH RIVER, a stream that rises among the hills in the southwest part of Virginia, passes into Tennessee, flows through the valley between Clinch Mountain and Powell Mountain, and unites with the Holston at Kingston, to form the Tennessee. Its length is estimated at above 200 miles, for more than half of which it is navigable by small boats.

CLINEDINST, Benjamin West, American artist: b. Woodstock, Va., 1860. He studied for a year in Baltimore and for five years in Paris under Cabanel and Bonnat and first attracted attention in New York with his illustrations for *Leslie's Weekly*. He is a painter of portraits and pictures in the genre style, and in 1900 was awarded the Evans prize of the American Water Color Society. He is best known as a popular illustrator of stories in the leading illustrated magazines, the *Century, Harper's Magazine* and *Scribner's Magazine*, especially containing much of his work. He has illustrated the works of Hawthorne, Stevenson and Mark Twain, although he works also in oil and water colors. His sympathetic collaboration with the author gives his work an especial charm. He has painted portraits of Theodore Roosevelt, Admiral Peary, Gen. Curtis Lee, Edward Echols, etc.

CLINGMAN, Thomas Lanier, American senator: b. Huntsville, N. C., 27 July 1812; d. Raleigh, N. C., 4 Nov. 1897. He was graduated at the University of North Carolina 1832, adopted the legal profession, and was a member of the State legislature 1836–40. He was elected to Congress as a Whig and with the exception of the 29th Congress, served continuously from 1843 to 1858, when he was appointed United States senator. During his service in the House he took part in all the leading debates, not missing, it is said, a single day's session, and for a time was chairman of the Committee on Foreign Affairs. He later joined the Democratic party. Entering the Confederate army as a colonel, he was promoted brigadier-general 17 May 1862, commanding the North Carolina troops, and served until his surrender with Gen. J. E. Johnston in April 1865. After the war he was chiefly engaged in mining and scientific pursuits. The important mica mines in Mitchell and Yancey counties were first opened by him. He also made known the existence of diamonds, rubies and corundum in North Carolina. He published a volume of 'Speeches and Writings' (1877); 'Follies of the Positive Philosophers' (1878); and 'The Tobacco Remedy' (1885).

CLINGMAN'S DOME, a peak of the Smoky Mountains, near the boundary between Tennessee and North Carolina. It was so named in honor of Thomas L. Clingman (q.v.). Its height is 6,619 feet above the sea-level.

CLINIC, an institution devoted to the examination and free treatment of patients, for the purpose of giving medicine and at the same time offering an opportunity to students of medical colleges for practical instruction. Clinics are usually held in dispensaries, where, by reason of free treatment, many patients congregate, thus affording good clinical material. The term «clinical medicine» is applied to the branch of medicine occupied with the investigation of diseases at the bedside.

CLINK-STONE. See PHONOLITE.

CLINOMETER, klī-nŏm'ę-tėr, an instrument used for taking the dip and strike of rock strata. In its commonest form it consists of a sort of protractor with a pendulum attached. When the clinometer lies horizontally the indicator points to 0 degrees, and when inclined the amount of inclination is shown at once by the pendulum. It is most convenient to combine compass and clinometer in one instrument.

CLINOPODIUM, a genus of herbs or low shrubs of the mint family (*Menthaceæ*), containing about 50 species, of which several occur in the southeastern United States and California. The plants are known under the common names of wild basil, calamint and basil balm.

CLINTON, Charles, American colonist, ancestor of the Clintons in New York: b. County Longford, Ireland, 1690; d. Ulster, now Orange County, N. Y., 19 Nov. 1773. His grandfather was an adherent of Charles I, and after the defeat of the royalists fled for refuge to the north of Ireland; and his mother was daughter of a captain in the parliamentary army. Having determined with a number of his friends to emigrate to America, he chartered a ship, and sailed for Philadelphia 20 May 1729. After a passage marked by the attempt of the captain to starve the passengers in order to possess their property, and in which after the death of several, among whom were a son and daughter of Mr. Clinton, it was proposed, but not attempted, to wrest the command from the captain, he was landed with his companions 4 October at Cape Cod. The place for a permanent settlement was selected in the spring of 1731 in Ulster County, N. Y., about six miles west from the Hudson River, and 60 miles north from New York. Clinton was chiefly occupied as a farmer and land surveyor, but was also judge of the County Court, and in 1756 was appointed lieutenant-colonel, and served with two of his sons in the expedition against Fort Frontenac.

CLINTON, De Witt, American statesman: b. Little Britain, New Windsor, Orange County, N. Y., 2 March 1769; d. Albany, 11 Feb. 1828. His descent on the father's side was from English ancestors long domiciled in Ireland, and on the mother's side he was of French extraction. His education was begun in a grammar school near his home, continued at the academy in Kingston, Ulster County, and completed at Columbia College, where he bore away the college honors in 1786. He immediately engaged in the study of the law and was admitted to the bar in 1788. His ardent temper and earnest ambition carried him at once into the political field, and his sentiments, sympathies and affections determined his position under the banner of his kinsman, George Clinton, the chief within the State of the Republican party. While the question of the adoption of the Federal constitution was yet a subject of popular discussion, he proved his zeal and controversial power by writing a series of letters signed «A Countryman,» in reply to the celebrated letters of the *Federalist*. He entered the legislature in 1797 and the State senate in 1798, soon becoming the leader of his party in the State. In 1801 he became United States Senator, resigning in 1803 to assume the office of mayor of New York. He remained undisturbed in the mayoralty from 1803 until 1807, when he was removed. He was reappointed in 1809, was displaced in 1810, was restored in 1811 and thenceforward continued therein until 1815. Within this period of nearly 12 years, Clinton was also a member of the senate of the State from 1805 until 1811, was lieutenant-governor from 1811 to 1813, and during a portion of that time also held a seat in the council of appointment. He was an unsuccessful candidate for the Presidency in 1812. He adopted early and supported ably and efficiently the policy of the construction of canals, from Lake Erie and Lake Champlain to the tide-water of the Hudson, and showed to his fellow citizens, with what seemed a spirit of prophecy, the benefits which would result from those works to the city, the State and the whole country, in regard to defense, to commerce, to increase of wealth and population and to the stability of the Union. In 1815 he presented a memorial to the legislature in behalf of the construction of the Erie Canal and in 1817 a bill was passed authorizing the work. In 1817 he was elected governor of New York and re-elected in 1820. He declined re-election in 1822, but was again elected in 1824, and after overcoming constant, unremitting and factious resistance, he had the felicity of being borne, in October 1825, in a barge on the artificial river which he seemed to all to have constructed from Lake Erie to the bay of New York, while bells were rung and cannons saluted him at every stage of that imposing progress. No sooner had that great work been undertaken in 1817 than the population of the State began to swell with augmentation from other States, and from abroad; prosperity became universal; the older towns and cities expanded, new ones rose and multiplied; agriculture, manufactures and commerce were quickened in their movements, and wealth flowed in upon the State from all directions He was re-elected governor in 1826, dying while in office. He wrote 'Discourse before the New York Historical Society;' 'Memoir on the Antiquities of Western New York'; 'Letters on the Natural History and Internal Resources of New York'; 'Speeches to the Legislature.' Consult Alexander, 'Political History of the State of New York' (Vol. I, New York 1906); Hosack, 'Memoir of De Witt Clinton' (1829); McBain, 'De Witt Clinton and the Origin of the Spoils System in New York' (New York 1907); Orth, 'Five American Politicians' (Cleveland 1906); Renwick, 'Life of De Witt Clinton' (1840); Campbell, 'Life of De Witt Clinton' (1849).

CLINTON, George, Vice-President of the United States: b. Little Britain, Ulster County, N. Y., 26 July 1739; d. Washington, D. C., 20 April 1812. He was a son of Charles Clinton (q.v.) and served as lieutenant under his brother James at the capture of Frontenac, but afterward studied law. He was a member of Congress in 1776, and voted for the Declaration of Independence, but was summoned to the army as brigadier-general before it was prepared for signature. In 1777 he was elected governor and at the same time lieutenant-governor of the State of New York, which latter office was, on his acceptance of the other, conferred upon Mr. Van Courtlandt. He held the office of governor during the next 18 years, for which eventful period the history of his life is that of the State. He was again chosen governor after spending five years in private life, in 1801, and in 1804 became Vice-President of the United States. Consult 'Public Papers of George Clinton' (6 vols., New York 1899-1902).

CLINTON, George Perkins, American botanist: b. Polo, Ill., 7 May 1867. He was educated at the University of Illinois and at Harvard University. He was assistant botanist at the Illinois Agricultural Experiment Station and assistant in botany at the University of Illinois in 1890-1902, and since 1902 has been botanist at the Connecticut Experiment Station and botanist of the Connecticut State Board of Agriculture. He is the author of botanical monographs and experiment station bulletins dealing with parasitic fungi and contributions to botanical magazines.

CLINTON, George Wylie, American negro bishop: b. Cedar Creek Turnpike, Lancaster County, S. C, 28 March 1859. He was educated at Brainerd Institute, at South Carolina University and at Livingston College, Salisbury, N. C. In 1879 he entered the ministry of the American Methodist Episcopal Zion Church. He taught for 12 years in the Lancaster (S. C.) High School and Union (S. C.) graded schools and was for eight years president of the Atkinson Literary and Industrial College at Madisonville, Ky. He founded the American Methodist Episcopal Zion *Quarterly Review* in 1889 and edited it for two years. In 1902-06 he edited the *Star of Zion* and was elected bishop in 1896. He is a member of the executive committee of the Federal Council of the Churches of Christ in America and is prominent in the social and educational work among the negro race. He is the author of 'The Negro in the Ecumenical Conference of 1901'; 'The Three Alarm Cries' (1906); 'Tuskegee Lectures' (1907); 'Christianity under the Searchlight' (1909).

CLINTON, Sir Henry, English general: b. about 1738; d. Gibraltar, 23 Dec. 1795. He was the grandson of Francis, sixth earl of Lincoln, served in the Hanoverian War and was sent to America as major-general in 1775. He took part in the battle of Bunker Hill, and in the battle on Long Island which resulted in the evacuation of New York by the Americans; proceeded up the Hudson in 1777 in a vain effort to relieve Burgoyne, and was promoted to the chief command of the British army in America in 1778. After being forced by Washington to evacuate Philadelphia, he commanded an expedition to South Carolina in 1780, and blockaded and captured Charleston. He sailed from New York with 7,000 men to relieve Cornwallis on the very day that the latter capitulated. He resigned in 1781, returned to England the next year and died soon after he had been appointed governor of Gibraltar. He wrote a narrative of his conduct in America (1783), and a rejoinder to Lord Cornwallis' observations on it; also ‘observations on Stedman's ‘History of the American War’ (1784).

CLINTON, James, American military officer: b. Little Britain, Ulster County, N. Y., 9 Aug. 1736; d. there, 22 Dec. 1812. He was the fourth son of Charles Clinton (q.v.). With his father he served at Frontenac, in 1758, as captain, and commanded in 1763 the forces raised to protect Ulster and Orange counties against the Indians. He accompanied Montgomery to Quebec in 1775, and was appointed brigadier-general the following year. While his brother George was governor of New York, he was overpowered at Fort Clinton by the superior force under Sir Henry Clinton, and being severely wounded narrowly escaped with his life. He afterward served against the Indians under Sullivan in 1779 and was present at the surrender of Cornwallis. After the peace he was commissioned to adjust the boundary line between New York and Pennsylvania and occupied many distinguished civil stations. His son was De Witt Clinton.

CLINTON, Canada, town of Huron County, Ontario, situated on the Buffalo & G. branch of the Grand Trunk Railway, about 32 miles northwest of Stratford. Its industries are numerous. There are salt-wells, a tannery, grain-elevator, and a flour mill and factories for the production of carriages, organs, threshing-machines, fanning-mills, etc. Pop. (1911) 2,254.

CLINTON, Ill., county-seat of De Witt County, situated on the Illinois C. Railroad, about 42 miles northeast of Springfield. The chief industry of the region is farming. There are machine shops here, and the city has an electric-lighting system and waterworks, several churches and two public schools. It has adopted the commission form of government. Pop. 5,165.

CLINTON, Iowa, city and county-seat of Clinton County, situated on the Mississippi River and on the Chicago & N. W., Chicago, M. & St. P., Chicago, B. & Q., Chicago, R. I. & Pac. and Iowa Midland, 128 miles west of Chicago and 60 miles southeast of Dubuque. The city is a trade centre for a region of 50 miles radius and has large manufacturing and other industries, including lumber mills, furniture factories, sash and door factories, iron bridge works, gasoline engines, boats, automobiles, wagons, harness, boxes, brick, locks and railroad machine shops. The United States census of manufactures for 1914 recorded 105 industrial establishments of factory grade, employing 3,178 persons, of whom 2,679 were wage earners, receiving annually $1,614,000 in wages. The capital invested aggregated $8,068,000, and the year's output was valued at $10,484,000: of this, $3,535,000 was the value added by manufacture. The city has a good public library, hospitals, business colleges, Wartburg Lutheran College, Mount Saint Clare Academy, Our Lady of Angels Seminary, churches of all denominations, public schools, five banks with a combined capital of $800,000, electric lights and railways. The present form of government is by a mayor and a council of nine members who are elected biennially. Pop. 26,800.

CLINTON, Mass., town of Worcester County, 12 miles northeast of Worcester, 14 miles from Fitchburg, and 40 miles west of Boston, on the Nashua River, and the Boston and Maine, New York, New Haven and Hartford and Massachusetts Central railroads. It contains a national bank, with a capital of $200,000, a savings bank and two co-operative banks. The Bigelow Free Public Library contains over 41,000 volumes. There are several churches and also the Clinton Hospital and the Clinton Historical Society. The town has recently erected one of the finest municipal buildings in the State at a cost of $200,000 and the union station is also a noteworthy building. There is a fine system of parks and playgrounds and there are many excellent schools. The great metropolitan reservoir and dam, costing $15,000,000, which supplies the city of Boston and 18 neighboring towns with water, is situated here. There is electric and gas service and an electric car service connects Clinton with the surrounding towns. The chief industries are the manufacture of wire-cloth, ginghams, carpets and rugs, woolens, worsteds, Turkish towels, yarns, gasoline engines, harness, and iron and brass castings. The government is administered by means of town meetings. The board of selectmen holds office for three years and appoints the chief of police and other subordinate officials. Up to 1850 Clinton was a part of Lancaster (q.v.), but it was then incorporated as a town. Pop. 13,075.

CLINTON, Miss., town in Hinds County, 10 miles west of Jackson, on the Alabama and Vicksburg Railroad. Hillman College and the Mississippi Baptist College are located here. The city owns the lighting plant and the waterworks. Pop. 767.

CLINTON, Mo., county-seat of Henry County, 37 miles northwest of Sedalia, on Missouri, K. & T., the Saint Louis and San F. and Kansas City, Clinton and Springfield railroads. Clinton has three flour mills, two corn-meal mills, cooperage and railroad division shops, ice plant and foundry and gas-engine factory. It has two banks with a combined capital of $75,000, and has an annual business of $25,000,000. Clinton has an excellent public school system, and also colleges for men and women, including Bind College for Women and Clinton Business College. The city was first settled in 1837, became a borough in 1858 and a city in 1876. It is governed by a mayor and a council of eight members elected for two years. Pop. 4,992.

CLINTON, N. Y., village of Oneida County, situated on the New York, O. & W. Railroad, nine miles south of Utica. In the neighborhood there are stone quarries. The chief interest of the place lies in its educational institutions. Here is located Hamilton College (q.v.), and there are seminaries for young women, an academy and a union school. Iron ore mines and mineral springs are found in the vicinity. Pop. 1,236.

CLINTON, Okla., city in Custer County, 95 miles west of Oklahoma City, on the Washita River, the Chicago, Rock Island and Pacific, the Saint Louis and San Francisco, the Clinton and Oklahoma Western, the Kansas Central, Mexico and Orient railroads. It has cottonseed-oil mills, alfalfa mills, cotton compresses and a broom factory. The most noteworthy buildings are the municipal hospital and the courthouse. The electric-lighting plant and waterworks are the property of the municipality. Pop. 2,781.

CLINTON, S. C., town in Laurens County, 60 miles northwest of Columbia, on the Seaboard Air Line and the Columbia, Newberry and Laurens railroads. The town is the seat of the Thorwell Orphanage and the Presbyterian College of South Carolina. Cotton manufacture is the chief industry. The municipality owns the electric-lighting plant and the waterworks. Pop. 3,300.

CLINTON STAGE, in American geology, the middle member of the Niagara Series of the Silurian System. It comprises shales and shaly sandstones with some limestone, and is typically developed at Clinton, N. Y. From New York the series extends southward along the Appalachians to Alabama, reaching its maximum thickness of over 800 feet in Pennsylvania. From the Appalachians the series stretches 1,000 miles westward, except for the area of the Cincinnati anticline, to Wisconsin, where the series is represented by limestones. From one to three beds of oölitic hematite (fossil iron ore), from 1 to 10 feet thick, are found in the Clinton at many points along the Appalachians and have yielded considerable ore. See NIAGARA SERIES; SILURIAN SYSTEM.

CLINTON STATE PRISON, penitentiary located at Dannemora, Clinton County, N. Y. It was begun in 1844. The prison buildings are enclosed in a stockade which encloses 37 acres of land. The site was chosen with the object of employing the prison inmates in the mining and manufacture of iron, much ore being discovered on the 37 acres surrounding the prison. Cotton spinning, the making of clothing, tinware and wooden ware are the industries conducted there at present.

CLINTONIA, a genus of plants of the lily-of-the-valley family (*Cornvallariaceæ*), named after De Witt Clinton, naturalist and governor of New York. It comprises six species, four of which are natives of North America, the other two being Asiatic. Yellow clintonia (*C. borealis*), has greenishly-yellow drooping flowers, with blue berries. It grows in moist woods from Newfoundland south to North Carolina, and westward to Wisconsin and Minnesota. The white clintonia (*C. umbellulata*) is found in the woods of New York and New Jersey, and as far south as Georgia, and westward through Tennessee.

CLINTON'S BIG DITCH, a phrase applied to the Erie Canal, connecting the Hudson River with the Great Lakes. The name was given in derision because the canal was planned and carried to completion by De Witt Clinton.

CLINTONVILLE, Wis., city in Waupaca County, on the Pigeon River, and on the main line of the Chicago and Northwestern Railroad, 50 miles north of Fond du Lac. It is well built, has concrete streets and walks, public and parochial schools, a Carnegie library, several churches, two banks, opera-house and a city park. It manufactures automobiles, tractors, sashes and doors, washing machines and contains machine shops, feed mills, saw and planing mills, pickle and kraut factory, a creamery and an ice plant. It is located in a thriving dairying section. The waterworks and electric-lighting plants are the property of the municipality. Pop. 4,000.

CLIO, (from Gk. *κλειν*, to celebrate), daughter of Zeus (Jupiter) and Mnemosyne (Memory), the muse of history. She is represented with a wreath of laurel upon her head and a roll of papyrus in her left hand. She was the mother of Hyacinthus and Hymenæus. There was also a sea nymph named Clio, daughter of Oceanus and sister of Beroe, who figures in Greek mythology.

CLIONIDÆ, klī-ŏn′ĭ-dē, a family of *Pteropoda* (q.v.), which lack the shell and external gills, have the body spindle-shaped with wing-like fins situated near the head, and the head provided with short tentacles. They are pelagic animals of remarkable transparency, and live in vast numbers in the Arctic and Antarctic seas. Their chief popular interest lies in the fact that one species, *Clio borealis*, although only about an inch in length, furnishes the chief food of the great whalebone whales of the north. The whalers call the schools of these pteropods brit and deem their presence a good sign of whales.

CLIP HOOKS, two hooks, the points of which are turned in opposite directions. These points are made to overlap and lock closely so as to form a single eye when the necks of the hooks are lashed together. The eyes of the hooks are on the same pivot and are also designed to fit closely to each other.

CLIPPER, the word used to designate a modern construction of large sailing vessel. The peculiarities of these vessels are, their long sharp bow, their greatest beam lying abaft the centre of the ship and their depth of keel. The speed attained by the opium and slave traders had attracted the attention of naval architects generally, and the shipbuilders of Great Britain (notably those of Aberdeen and Liverpool) and of America vied with each other in producing vessels which, while preserving fair carrying capabilities, should, as the primary requisite, be fast sailers. In this they succeeded to a remarkable extent, and the feats of the Atlantic, Australian and China clippers, some of which attain an average speed during the voyage of over 15 miles an hour, used to be a topic of great interest and excitement among those connected with shipping and ocean traffic. Owing to the improvements in steam vessels, and the many advantages possessed by them over sailing vessels, clippers, as a special type of ship, are now little heard of. The effect of the model was shown in many subsequent ships and yachts.

CLIPPER BOW, an overhanging bow, found in some wooden steamers. It differs from the bow of the old sailing-ship in that it rises in a smooth curve from cut water to bowsprit, while the latter had a reverse curve as it neared the bowsprit. Most modern steamers have a vertical stem.

CLISSOLD, Augustus, English Swedenborgian: b. about 1797; d. Tunbridge Wells, 30 Oct. 1882. He was graduated from Exeter College, Oxford, in 1823 was ordained priest, held the curacies of Saint Martin-in-the-Fields and Saint Mary, Stoke Newington, and about 1840 withdrew from the ministry. He had become a very close student of the writings of Swedenborg, and though retaining through life his connection with the Church of England he was president of the Swedenborg Association, became a life member of the Swedenborg Society and liberally assisted it with funds. Clissold translated and published at his own expense Swedenborg's ‘Principia Rerum Naturalium’ (1845–46) and ‘Œconomia Regni Animalis’ (1846). He wrote also many original works, the larger part on Swedenborg and Swedenborgian views.

CLISTHENES. See Cleisthenes.

CLITOMACHUS (Gk. Κλειτόμαχος), Greek philosopher: b. Carthage about 190 B.C.; d. Athens about 110 B.C. He went to Athens about 146 B.C., where he became identified with the Third, or New, Academy, of whose founder, Carneades, he was one of the most distinguished disciples. On the death of Carneades in 129 B.C., Clitomachus succeeded to the academic chair. Carneades wrote nothing, and Clitomachus was the chief expositor of the system of the New Academy. Diogenes Laërtius is authority for the statement that he wrote 400 books on philosophical subjects. Cicero, who appears to have devoted considerable study to the work of Clitomachus, praises him highly in the ‘Academica.’ He followed in his teachings the largely skeptical views of Carneades, denying the possibility of attaining absolute truth, or any certain criterion of truth. Of his works there remain only a few titles and some renderings by Cicero in the ‘Academica.’ Consult Zeller, ‘The Stoics, Epicureans and Sceptics’ (trans. by Reichel, London 1892).

CLITUS, klī'tŭs, son of Dropis, and foster brother of Alexander the Great. He was one of the generals of Philip and Alexander, and saved the life of the latter in the battle of the Granicus by cutting off the hand of Rhosaces, who had just lifted up his arm to kill Alexander. He held high positions in the Macedonian armies and in 328 was made satrap of Bactria. Notwithstanding this service, however, Alexander killed him in a fit of anger at a banquet in honor of Dioscuri, an act of which he repented sorely afterward.

CLIVE, Catherine Raftor, Kitty Clive, English actress: b. London 1711; d. 6 Dec. 1785. She was the daughter of a poor Irish gentleman living in London, and coming to the notice of Colley Cibber, manager of Drury Lane Theatre, made her début there at 17. She achieved instant success and till her retirement from the stage in 1769 was one of the most popular actresses of the time, her forte being comedy. She married George Clive in 1732, but was separated from him later. She was on intimate terms with many of the literary and social lights of her day and maintained an unblemished reputation. Among her friends was Horace Walpole, who presented her with a house at Strawberry Hill. She was the author of four dramatic sketches. Consult Fitzgerald, ‘Life of Mrs. Catherine Clive’ (1888); Doran, ‘Annals of the English Stage’ (1888).

CLIVE, Robert, Baron Clive, English soldier and statesman: b. Shropshire, 29 Sept. 1725; d. London, 22 Nov. 1774. His father obtained for him the place of a writer in the East India Company's service, and in his 19th year he went in that capacity to Madras. Two years later Madras surrendered to the French, but Clive escaped to Fort Saint David, where he entered the military service. He took part in the unsuccessful attempt to capture Pondicherry in 1748. When the British opposed Chunda Sahib, whom the French wished to make nabob of the Carnatic, and their candidate was besieged in Trichinopoly by Chunda Sahib, Clive was sent in 1751 to attack Arcot, the capital of the Carnatic, which he captured without opposition and later with his small force beat off the attempts of overwhelming numbers to retake it. He then relieved Trichinopoly, and captured the forts of Covelong and Chingleput. In 1753 he went to England for a time, and on his return to India (1755) he was given the government of Fort Saint David. He was soon called to Madras to command the relief expedition sent to Bengal, where the nabob Suraj-al-Dowlah had taken Calcutta. Clive took possession of that city, and with a very inferior number of men entered the nabob's camp and captured his cannon. The nabob then offered terms of peace very advantageous to the English. Clive very shortly formed a plot to dethrone Suraj-al-Dowlah and place Mir Jaffier on the throne. In the famous battle of Plassey (21 June 1757) Clive's force of 3,000 men put to flight the nabob and his army of more than 50,000. Mir Jaffier now wished to govern without British interference, but the rebellions against him forced him to seek the aid of Clive, who was appointed governor of Bengal. Clive again went to England in 1760, when he was elected member of Parliament for Shrewsbury and raised to the Irish peerage. A disagreement between Mir Jaffier and the British governor officiating in Clive's absence caused Clive's return to India in 1764. He found the trouble with Jaffier settled, and devoted himself to the reform of the civil service in Bengal, and the restoration of discipline in the army. After his final return to England (1767) severe attacks were made upon him for his conduct in India, and a parliamentary inquiry followed which resulted in the passing of resolutions condemnatory of certain of his acts, and of a subsequent motion that he «had rendered a great and meritorious service to his country.» But the worry due to the attacks, together with his failing health, so depressed him that he committed suicide. He was the creator of the British Indian empire, the foundations of which he laid in 12 short crowded years.

CLOACA, a sewer, an underground drain or conduit. The city of Rome was at first drained by three natural streams. These were eventually confined within stone vaulted channels. The largest of these crossed the Argiletum, the Forum and Velabrum and was called the Cloaca Maxima (the greatest or main sewer). It is said to have been constructed under the direction of King Tarquinius Priscus (616–578 B.C.), but none of the existing part is older than the 3d century B.C. It is still used in the drainage of Rome. It received numerous other branches between the Capitoline, Palatine and Quirinal Hills. It is formed of three concentric rows of enormous stones, piled above each other without cement. The height inside is about 13 feet and its width is about the same. The flooring is like that of a Roman road. During the Republic, the duties of the censor included the supervision of the cloacæ. Under Cato they were repaired. Special «curatores cloacarum urbis» were placed in charge of them during the Empire.

In anatomy a cloaca is a part of the intestine in which the intestinal, ovarian and urinary outlets terminate. This structure exists in birds, in reptiles, in the amphibia and in the mammalian order *Monotremata.* In the *Rotifera* also the perivisceral cavity terminates in a dilatation or cloaca, which forms the common outlet for the digestive, generative and water vascular system. There is a cloaca also in insects, and one also in tunicated mollusks. The latter is sometimes called the atrial chamber. In the embryonic development of man there is a period during which a cloaca also exists.

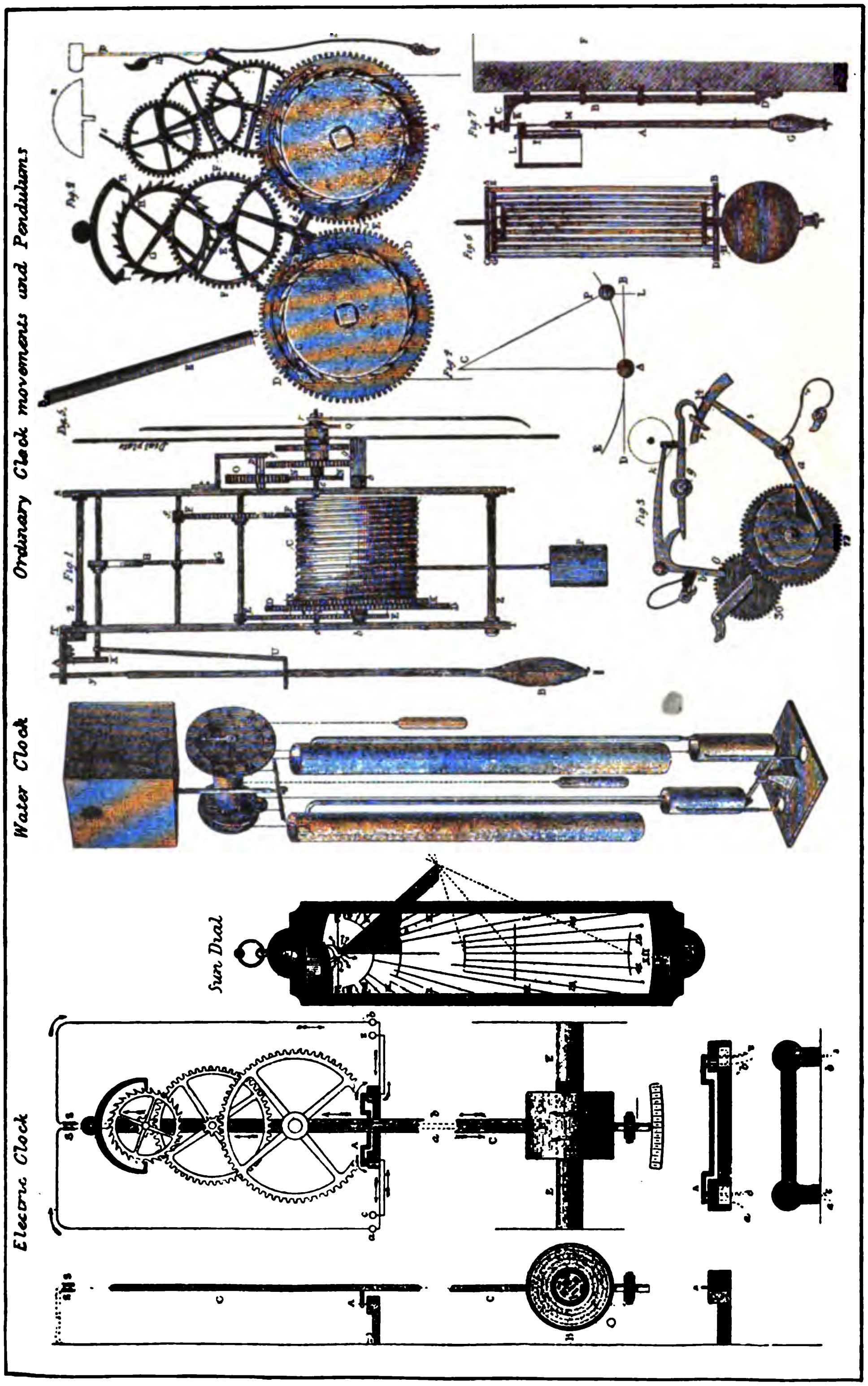
CLOCK. All instruments for the accurate measurement of time have three parts in common. One is a vibrating body, which may be a pendulum swinging under the force of gravity, or a balance wheel vibrating on its axis through the action of an elastic spring. The second feature is a source of power, which may be a weight or a stiff steel spring, called the main spring; the object of either is to keep up the vibrations of the balance wheel or pendulum, which would otherwise soon cease through friction and the resistance of the air. The third feature is a system of wheel work by which the power is transmitted from its source to the vibrating body, and by the revolutions of which the time is indicated. The instruments by which these results are brought about may be classified as watches, chronometers and clocks. The watch is a portable form of the instrument, generally so constructed as to be carried in the pocket and moved about into any position without interfering with its going. This requires that the source of power shall be a spring and the vibrating body a balance wheel. The chronometer (q.v.) is a larger and most accurate watch constructed on the same general principles, but intended, when moved, to maintain a horizontal position. The term is sometimes applied to the most accurate pocket watches; and to distinguish it from them the chronometer proper is sometimes called a marine chronometer. The term is chosen because the instrument is used to keep time at sea for the determination of a ship's longitude.

Construction.— In the original construction of the clock, to which this article is especially devoted, the vibrating body was the pendulum and the source of power a weight which could be wound up with a key. But, in order to secure the advantage of being easily handled and moved about it is now very common to make the smaller class of clocks with either a main spring or a balance wheel or both. But such clocks, unless made in the most expensive way, do not keep time as accurately as those with weight and pendulum; the latter are, therefore, to be preferred in all cases where a clock can be kept in one and the same position, and is wanted to keep fairly good time for considerable periods.

In the earliest instruments of these different kinds the vibrating body was a small horizontal bar, which moved back and forth under the influence of the wheel work. This was before the idea of applying a spring to keep up and regulate the vibrations had been suggested. Such instruments were extremely inaccurate in their results. The possibility of the pendulum clock dates from the time of Galileo, who first showed clearly that a pendulum completed its swings in nearly the same time, whatever its arc of vibration, which time was dependent on its length. But the practical inventor of the pendulum clock was Huyghens, the great Dutch astronomer of the 17th century. He invented the various appliances of the clock, the striking apparatus excepted, in substantially the form that we have them to-day. What is sometimes called the astronomical clock does not differ in principle from the ordinary pendulum clock, and has nothing distinctive about it except that it is made with the greatest perfection throughout in order to go with the utmost attainable uniformity from day to day. So successful have clock-makers been in recent times that an astronomical clock which varied by one-tenth of a second during a day would be regarded as practically useless. A good clock of the kind should keep time within three or four hundredths of a second a day.

The accompanying plate shows in detail the parts of the ordinary clock. Fig. 1 gives a lateral view of the wheel work. An end view of the mechanism is shown in Fig 2. P, Fig. 1, is a weight suspended by a cord which rests in a spiral groove going round and round the main cylinder C. In order that the clock may be wound up at any time, a ratchet wheel DD, Fig. 2, is used with a grooved cylinder, around which is wound a cord carrying the weight. The manner in which the ratchet acts is too obvious to need description. It is to be remarked that, in the ordinary house clock, the action of the wheel work stops while the weight is being wound up. As the clock then loses all the time taken to wind it up, the best class of clocks are constructed with a second ratchet which keeps them going while being wound. The action of the weight is transmitted through the train of wheels d, E and F, to the scape wheel GH, which acts on the pallets IR, connected with the crutch which acts on the pendulum. In Fig. 1 By is the pendulum and its crutch vibrating in a plane perpendicular to that of the paper. In the upper part of its length, which passes through the crutch U, it turns on a horizontal axis which can be seen in the figure extending horizontally from the framework of the clock from just above X to the right. Thus, as the pendulum vibrates the arm of the crutch UX vibrates with it. This vibration releases alternately the teeth of the scape wheel GH, a double motion of the pendulum back and forth being required in order that first one tooth and then the other may escape. As shown in the figure the end R of the anchor is moving upwards, the tooth H of the scape wheel being just about to slide off. During the time that the pallet R is holding the scape wheel, the latter slides and presses upon it, thus pressing the side of the crutch against the pendulum. When the tooth H escapes, the an-

CLOCKWORK


Ordinary Clock movements and Pendulums
Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Water Clock
Sun Dial
Electric Clock

chor is in such a position that another tooth strikes the lower surface of I and acts on that in the opposite direction while the pendulum is swung the other way. Thus the teeth escape alternately, first one and then the other, in regular alternation, gently pressing the pendulum during its swing each way.

The construction of the escapement is of the utmost importance when the best performance of a clock is required. If one examines the second hand of an old-fashioned house clock he will notice that, at the moment of each beat, the second hand moves forward to one second and then has a slight motion backward before the next beat. This backward motion takes place immediately after one tooth has escaped, and continues until the pendulum has sprung to its greatest distance on one side. This backward action throwing extra action on the pendulum tends to accelerate its motion. Hence, good clocks are provided with a «dead beat» escapement invented by Graham. In this form the pallet on which the teeth of the scape wheel first impinges is at right angles to the radius from the centre of motion of the anchor to the pallets themselves. The action of the scape wheel then does not begin until the pendulum reaches a certain point of its downward swing, which point is the same whether the swings are wide or narrow.

Under the system just described, the pendulum is kept in continuous vibration and the wheel work in continuous motion from the time the clock is wound up until it is run down. But it is also necessary that the clock shall, at every moment, show the time on its face. This is brought about by the wheels O and N, Fig. 1, one of which is arranged to revolve in an hour, the other in 12 hours. The result is too familiar to need any description. If the wheel work which moves the hand were rigidly connected with that of the clock, the latter could not be set without moving the whole of the clock work. The system of wheel work which carries the hands is, therefore, so arranged as to be held on the axis c, by friction, thus admitting of its being turned at pleasure, while it is held by the axis so long as the hands are untouched. The minute hand is rigidly attached to its axis in order that it may be used as a hand in turning the wheel work of the two hands. Generally, but not always, the hour hand is held on its axis only by friction so that it can be turned around at pleasure without interfering with the other hand or with the going of the clock.

Regulation.— It is, of course, necessary to the correct going of a clock that the length of the pendulum should correspond to the number of the teeth in such a way that, as the pendulum goes through its natural vibrations, the wheels shall go according to the time of day. In the old-fashioned house clock, and in most good modern clocks, when it is desired to show seconds as well as hours and minutes, the pendulum takes one second to oscillate in each direction. It is then called a «seconds pendulum.» There are then 30 teeth in the scape wheel, the latter turning through one-sixtieth of the revolution as each alternate tooth escapes. The seconds pendulum is about 39¼ inches in length. (See PENDULUM). It is not easy to move a clock about when the pendulum is so long. Hence, in ordinary clocks for household use either a balance wheel or a shorter pendulum is used. If the latter is one-fourth the length of the seconds pendulum, it will vibrate in half a second. But, as clocks are constructed, the pendulum is not always made to vibrate in any simple fraction of a second. In this case, although a second hand may be put on the clock, and may go through its revolution in a minute, its motions will not beat seconds.

The rate of going of ordinary clocks varies with the temperature, the clock going faster the lower the temperature. In the case of the pendulum clock this is because the pendulum rod contracts with cold and expands with heat. If a balance wheel is used, not only does the balance contract with cold but the spring which moves it becomes stronger; so that for a double reason the clock goes faster in cold weather. Hence if accurate time is to be kept the pendulum or balance wheel must be compensated for changes of temperature. To show how this is done in the case of the balance wheel, see CHRONOMETER. For the two methods of compensating a pendulum, see PENDULUM. Between the extremes of temperature to which the house clock is ordinarily subjected the differences of rate will only be about five or six seconds a day. As few people are able to regulate their clocks to this degree of precision it is only in very good clocks that compensation is attempted. The effect of heat and cold is much greater on the balance wheel than on the pendulum and may amount to half a minute of more a day.

Striking Mechanism.— The striking mechanism of the clock is brought about by a separate train of wheel work with its separate weight or spring, as shown in Fig. 2. There are two systems of making a clock strike the hour, one of which may be called the continuous system, and is used in clocks of American construction, while the other is mostly used in French clocks. The continuous system is one in which the striking goes on in its regular order, two always following one, three following two, and so on, no matter how the hour hand may be situated. In this system if the clock begins striking wrong through running down or from any other cause it will continue to strike wrong until a proper adjustment is made. This is effected by touching a spring or pulling a wire in the clock, by which the striking mechanism is set in action and the clock made to strike around until it comes to the right hour. The French system is arranged with an eccentric cam on the axis of the hour wheel which stops the striking mechanism when the hammer of the clock has struck a number of strokes corresponding to the position of the hour hand. On this system the striking mechanism needs no adjustment to strike correctly always.

Electric Clocks.— With the discovery of electricity and its development as a motive force, the horologists were among the first to attempt its use, as the ideal power to operate clocks. In the earlier devices the weight of the pendulum was changed from the usual vertical body to a horizontal form, provided with a coil, and caused to swing between two electro-magnets placed one above the other at the lowest point of the pendulum arc. Electrical connections made and broken alternately by attachments to the pendulum stem actuated the magnets so as to attract the swinging weight as it approached the magnets and repel it after it had passed the centre. These impulses, however, were found in practice to be unmanageable, and quite inadequate to the task of keeping the clock running uniformly. This idea was extended to comprise a row of electromagnets set in an arc close below the weight of the pendulum, the impulses of attraction and repulsion being taken up consecutively by one magnet after the other. This device also proved impracticable. Another device experimented with was the release by electrical action of a weighted bar, which in falling gave the stem of the pendulum a direct push. The bar was immediately pulled back to its normal position by an electro-magnet, to be again released when the pendulum should begin to flag in its appointed swing.

The so-called electric clocks of the present day are not time keepers but time transmitters. The actual measurement of time is made by a mechanical clock movement actuated by weights hanging from the barrel of a windlass — the centuries old and unrivalled «power» of the clock-maker. An electric current controlled by the clock mechanism is utilized to move the hands on a distant dial, or on several dials simultaneously — as in the case of tower clocks with four dials. Or it may be used to move the hands on the dials of many clock faces in a large establishment. Electricity is also used in a similar manner to synchronise with a single master clock a series of individual clocks scattered over a wide area. The devices for this kind of regulation generally act only upon the hands, forcibly moving them at stated intervals into the exact position of the hands on the master clock. A common application of electricity to tower clocks is through a mechanism known as the «waiting train.» The auxiliary works which move the hands is speeded up slightly to cover a half minute (or some other period) in two or three seconds less than the exact time. The train of wheels is then halted by a catch which is thrown off by an electro-magnet at the correct instant, and the auxiliary train resumes motion. Another adaptation of electricity to clocks is as a power to operate winding mechanism. To the winding-post a revolving armature is attached, and switches are so arranged with trips that as the weights near the bottom of the run the current is switched on and winding continues until the weights are at the top, when another trip throws the current off.

Tower Clocks.— Tower or turret clocks are subject to unusual stresses owing to their exposed location as to wind pressures, and the fact that the very large and heavy hands are out in the open, unprotected from the weather, and so liable to be irregularly loaded with snow and sleet. The great difficulty of building a clock of sufficient power to overcome these varied stresses, while steadily pursuing its delicate task of measuring time accurately, led to the separation of the time keeping function from the time displaying mechanism, and connecting the two by an electric, pneumatic or hydraulic transmission. The clock mechanism proper may then be located in a room near the ground where it is not affected by the swaying of the tower by the wind. It may be driven by a comparatively light weight, and an auxiliary and independent train in the tower, run by a heavy weight, be merely controlled by the clock. The weight in the tower train may be entirely dispensed with, and the power operating the hands furnished by hydraulic pressure, or by compressed air, or by an electric motor train, released, in all cases, by delicate connections made or broken by the clock mechanism. These auxiliary power movements are generally arranged to operate pallets which impart direct motion to «escape wheels» and thus connect with the usual wheel train to move the hands. The so-called «jumper clocks» are of this type, the half-minute or minute jumps being produced by a power impulse released by the master clock, acting on a ratchet-wheel.

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CLOCK AND WATCH INDUSTRY. See Watch-making, Modern.

CLOCKS, Historical and Celebrated. The most ancient form of clock was the clepsydra (q.v.) or water-clock. The clepsydra having been developed into a device with a dial and indicator operated by the current of water, the next improvement was the substitution of a weight for the water to operate the index. Archimedes is credited with this device. The necessity of some contrivance to regulate the descent of the weight led to the invention of the escapement and pendulum, a rude form of which is said to have been produced by Gerbert of Auvergne, afterward Pope under the name of Sylvester II, who died in 1003. In an old chronicle it is related that Charlemagne received a clock from Harun Al-Rashid in 809, to which small bells were attached and in which figures of horsemen, at the hour of 12, came forth through doors and retired again. There is a more exact description of this work of art in the Franconian annals, attributed to Eginhard, in which it is particularly said to have been a clepsydra and that at the end of each hour little balls of metal fell upon a bell and produced a sound. In the 12th century clocks were made use of in the monasteries, which announced the end of every hour by the sound of a bell put in motion by means of wheels. From this time forward the expression «the clock has struck» is often met with. The hand for marking the time is also made mention of. Of William, abbot of Hirschau, who died at the end of the 11th century, his biographer relates that he invented a horologium similar to the celestial hemisphere. Short as this account is, it still appears probable that this abbot was the inventor of clocks. In the 13th century there is again mention of a clock given by the Sultan Saladin to the Emperor Frederick II. This was probably put in motion by weights and wheels, as it marked the hours, the course of the sun, of the moon and the planets in the zodiac. In the 14th century there are stronger traces of the present system of clock-work. Dante mentions clocks. Richard, abbot of Saint Albans, made a clock in 1326 which indicated the course of the sun and moon, as well as the ebb and flow of the tide. Large clocks on steeples were first made use of in the 14th century. In 1340 a monk named Peter Lightfoot made for Glastonbury Abbey a clock with an escapement and regulator for securing equable motion. At the time of the Reformation it was removed to Wells Cathedral where part of it still remains. In 1835, the mechanism being entirely worn out, the clock was supplied with new works and the dial somewhat remodeled and a minute circle and index added. At the base of the arched pediment which surmounts the square of the dial is an octagonal projection from which rises a panelled turret. Around this, fixed to two rings of wood, are sets of horsemen which formerly revolved in opposite directions as the hour was struck.

Of all horological machines, the successive clocks at Strassburg Cathedral have perhaps attracted the most attention as mechanical curiosities. These have been three in number. The first was constructed about 1352, the second in the latter part of the 16th century. Early in the 19th century it was evident that reconstruction was necessary, and this was ultimately entrusted to Charles Schwilgue, who entered on his task in 1838 and completed it about the middle of 1842. On the 2d of October of that year the new life of the resuscitated marvel was solemnly inaugurated. On the floor level is a celestial globe indicating sidereal time, and the rising, setting and passage over the meridian of Strassburg of all stars visible with the naked eye. Behind this is a calendar showing months, days of the month, dominical letters and all feast days. Above the calendar is a gallery with allegorical figures representing the days of the week (Sunday, Apollo drawn in a chariot by horses; Monday, Diana drawn by a stag; Tuesday, Mars; Wednesday, Mercury; Thursday, Jupiter; Friday, Venus; Saturday, Saturn), which pass in order from left to right. Above this is a dial for showing ordinary time, a planetarium and a globe showing phases of the moon. Next come movable figures representing the four ages of man, which strike the second stroke of each quarter on a bell. A genius seated beside the ordinary dial strikes the first note of each quarter with a sceptre; the genius on the opposite side turns an hour-glass at each hour. Death strikes the hour with a bone. Above, a procession of the 12 Apostles passes at noon before Christ, bowing at his feet, while he makes the sign of the cross. During the procession a cock perched on the top of the left-hand turret flaps its wings, ruffles its neck and crows three times.

A clock at Berne which dates from 1527 presents some curious features. Three minutes before the hour a wooden cock crows and claps its wings; in another minute a procession of bears (baren, referring to the name «Berne») passes around a seated figure of a bearded old man; the cock (above the arch, and to its right) then crows again. The hour is struck on a bell at the top of the tower, by a figure with a hammer, and at each stroke, the bearded figure raises his sceptre and opens his mouth, while he turns an hour-glass; a bear inclines his head at the same time. Then the cock crows again.

Another celebrated clock is at Venice, dating back to the 17th century. It has a dial of blue and gold and is surmounted by bronze figures which strike the hours upon a bell. On Ascension Day, and for 14 days after, figures of the Magi come forth in procession and salute the Virgin and Child (as shown above dial) when the clock strikes 12.

Yet another is the clock of the English Houses of Parliament at Westminster. It was designed by Lord Grimthorpe (then Mr. E. B. Denison) and was first set going in 1860. The tower is 320 feet high and the dials are 180 feet from the ground. Each of them is 22½ feet diameter, of opalescent glass set in an iron framework. The hour figures are two feet long and the minute spaces one foot square. The works contain three trains — one drives the hands, another the mechanism for striking the hours, the third the chimes. The pendulum is fully 13 feet long and weighs nearly 700 pounds. The going part of the clock requires winding once a week, the striking parts twice. The hour bell weighs 13 tons, the quarter bells collectively eight tons. Though there are clocks with larger dials, this clock is probably the most powerful as well as the most accurate of all large timekeepers. It cost more than $110,000.

The United States has produced numerous notable clocks, most of them, however, smaller than the great clocks of Europe, if we except several that have been erected on great buildings of late years. Among the early American clocks which have become famous is one made by David Rittenhouse, in Philadelphia in 1767, and since then known by his name. It has six dials, each of which marks different astronomical events. The «Columbus, Ohio, clock» also records numerous astronomical events and contains many miniature figures, which are made to perform various motions. This clock is 11 feet high by 18 wide. Donaldson, Wilkes-Barre and Hazleton, all in the State of Pennsylvania, have also produced notable clocks.

Felix Meyer of New York, in 1880, after 10 years' work and experimenting, produced a remarkable clock, which showed local time in hours, minutes and seconds, the days of the week and the month, the seasons, the signs of the zodiac, the revolutions of the earth round the sun and on its own axis, the movements of the planets round the sun and the phases of the moon. It shows the difference in time at Washington, San Francisco, Chicago, Cairo, Melbourne, Constantinople, Peking, London, Paris, Berlin, Vienna and Saint Petersburg. A child strikes the quarter-hour, a youth the half-hour, an old man the three-quarter-hour and death the hour, while Washington rises from his seat and, extending his right hand, presents the Declaration of Independence. A servant opens a door and the other Presidents of the United

States, up to the time when the clock was made, each dressed in the characteristic costume of his day, come forward, salute the first President of the nation and, passing on, disappear through another door. The Meyer clock is 18 feet high, 8 wide and 5 deep and contains over 2,000 wheels.

One of the notable modern clocks of the United States is that in the tower of the Metropolitan Life Building in the city of New York, where it was placed in 1909. It has four dials each 26½ feet in diameter and situated one in each side of a tower nearly 350 feet above the street. This tower, which is twice this distance in height, is crowned by a lantern which signals, by flashes, the hours and quarters, the hours being lighted up by 88 white lights and the quarters by 56 red ones, the two giving a total candle power of 16,262. One of the features of this clock is a set of chimes which, among other things, sounds the hours and the quarters from 8 A.M. to 6 P.M. An idea of the enormous size of this clock may be gathered from the fact that the minute hand measures 17 feet and the hour hand 13 feet 4 inches. In the office of the director of the building is a clock which controls all the machinery of the larger clock and handles the time service of the whole building. It is driven by electricity and is self-winding. Naturally the great dial, situated as it is at such a height from the city street, is one of the noteworthy features of the clock. The numbers on it are 4 feet high and the minute marks are 10½ inches long. The minute hand is lit up by 16 and the hour hand by 10 incandescent lamps.

The largest clock in the United States is that erected over the works of the Colgate Company, in Jersey City. Its enormous dial is 38 feet across and it contains within its circle 1,134 square feet. The minute hand is 20 feet long and the mechanism is run by a 2,000-pound weight. The clock itself weighs six tons and its hands are outlined by incandescent lights, while brilliant red lamps mark each numeral. The minute spaces, which are 24 inches apart, are also shown by electric lamps. It has been estimated that the extreme end of the minute hand travels more than half a mile in the course of a day. The second largest clock was built for the Edison Electric Illuminating Company, Boston, Mass. Specifications: Dial, 34 feet in diameter; weight of hands, 875 pounds; hour hand, 14 feet 4 inches long; minute hand, 18 feet 6 inches long.

CLODD, Edward, English writer: b. Margate, Kent, 1 July 1840. He entered commercial life in 1860 and was secretary of the London Joint Stock Bank, 1872–1915. He is the author of 'The Childhood of the World' (1872); 'The Childhood of Religions' (1875); 'Jesus of Nazareth' (1880); 'Myths and Dreams' (1885); 'Story of Creation' (1888); 'Story of Primitive Man' (1895); 'Primer of Evolution' (1895); 'Pioneers of Evolution' (1897); 'Grant Allen' (1900); 'Story of the Alphabet' (1900); 'Thomas Henry Huxley' (1902); 'Animism' (1906).

CLODIA, one of the three sisters of Publius Clodius Pulcher (q.v.). She was married about 60 B.C. to Quintus Metellus Celer, who died the following year, probably from poison. Cicero having rejected her advances, she conceived a mortal hatred against him, and, in concert with her brother, used every possible means to effect his ruin. On her accusing Cælius Rufus of an attempt to poison her, Cicero undertook his defense, and depicted her dissolute life in a speech which is still extant. Her younger sister Clodia married Lucullus but was put away on account of her conduct. Consult the 'Prolegomena' to Ellis's edition of Catullus (LXIII-LXXII, Oxford 1889).

CLODION, clō-dē-ôṅ' (real name CLAUDE MICHEL), French sculptor: b. Nancy, Lorraine, 1738; d. Paris 1814. His mother was a daughter of Jacob Sigisbert Adam, a prominent French sculptor. Clodion went to Paris in 1755 and entered the studio of his uncle, Lambert Sigisbert Adam, also a sculptor. Upon his uncle's death he continued his studies with Pigalle. In 1759 the winning of a prize opened the way for him to go to Rome three years later. He remained there until 1771 with orders for the Duc de la Rochefoucauld and Catherine II of Russia. When he returned to Paris it was with the fame of a successful artist. The king, the nobility and many other wealthy patrons kept him busily at work — not including the clergy who looked on Clodion's dallyings with *sujets libres* with no little severity. As daring as his nude groups occasionally are, however, the sculptor's style is so masterly, his classical feeling for relations of form is so sure — even when copying in realistic manner the charms of a pretty model — that it would need a prude indeed to object to him. He is to be ranked with the most admirable of the Dix-Huitième artists. Like so many of them he was relegated to a quite secondary place after the Revolution, which hated his patrons and had no use for the elegance in ideas or in art of the foregoing period. Clodion himself felt that he was no longer a man of his time. He withdrew to his native Nancy when commissions failed in Paris. The capital lured him back however in 1798 and he tried to fit in with the new style in art. It is pleasant to know that he again achieved some measure of well-being, though he never again reached the point of happiness and favor that he had enjoyed under Louis XVI. We may note the following works by Clodion in public galleries: Nantes, 'Children Dancing About Pan'; Versailles, 'Faith'; Berlin, 'Amours' and 'Faun and Amours'; New York (Metropolitan Museum), 'Bacchus, a Nymph and Cupid' and 'The Fascination of Wine.' Mention may also be made of his 'Montesquieu' and 'Vestal crowned with Flowers' at the Palais de l'Institut, his decorations for the Arc du Carrousel and the Colonne de la Grande Armée all in Paris, and his statue and relief of Saint Cecilia at the Rouen Cathedral. Consult Thirion, 'Les Adam et Clodion' (Paris 1885).

CLODIUS, Publius, surnamed **Pulcher,** a Roman politician, son of Appius Claudius Pulcher, who lived from about 93 to 52 B.C. In the third Mithridatic War he served under his brother-in-law Lucullus, but considering himself ill-treated, he stirred up a revolt and then joined the army of another brother-in-law, Quintus Martius Rex, proconsul of Cilicia. He was given command of the fleet and fell into the hands of pirates, but obtained his liberty. He then went to Syria where he stirred up another mutiny. Returning to Rome in 65 B.C., he rendered Cicero service as a bodyguard. There are no sufficient reasons extant for believing that he was implicated in the Catilinean conspiracy. Cicero's violent attacks on the action of Clodius at the mysteries of the Bona Dea where he attempted an intrigue with the wife of Cæsar made Clodius resolve revenge. After returning from Sicily where he had been quæstor, he renounced his rank and was elected tribune of the people. He enacted corn laws, re-established the guilds and adopted other measures destined to gain popular favor. Having gotten rid of Cicero, he confiscated his property and became master of Rome with the aid of gangs and secret societies. He resisted the proposal of the recall of Cicero by force. He became a candidate for the prætorship against Titus Annius Milo. The rivals collected armed bands and fought in the streets of Rome where Clodius was killed. The celebrated speech of Cicero in defense of Milo has saved the name of Clodius from oblivion. Consult Plutarch's 'Lives'; Beesley, E. S., 'Cicero and Clodius' (in *Fortnightly Review*, Vol. V); White, H., 'Cicero, Clodius and Milo' (New York 1900).

CLODT-JURGENSBURG, klōt-yoor'gĕns-boorg, **Peter Karlovitch**, Baron, Russian sculptor: b. Petrograd 1805; d. 1867. He studied at the artillery school of his native city, served a short time in the army, and studied sculpture at the Petrograd Academy, where he was afterward a professor. He was very successful in depicting horses in action. His noteworthy works are the horses of the quadriga group on the triumphal arch at Petrograd and the four groups of 'Horse Tamers' in bronze, on the Anitchkov Bridge, Petrograd. There are replicas of two of the latter at the Schloss, Berlin, and at the Piazza del Re, Naples.

CLŒLIA, klē'lĭ-a̤, a girl of Rome, who, the legends say, having been given up to Porsena as a hostage, escaped to Rome by swimming the Tiber. The Romans, however, to keep faith with Porsena, sent her back to him. Porsena would not retain her, but, as a reward for the generosity of the Romans, freed her and her fellow hostages, and also gave her several of the Etrurian youths for her service. A statue was erected in her honor on the Via Sacra.

CLOG ALMANAC, an almanac or calendar made by cutting notches or characters on a clog or block, generally of wood. The block had generally four sides, three months for each edge. The number of days is marked by notches, while various symbols are used to denote saints' days, the golden number, etc.

CLOISONNÉ, in ceramics, a method of enameling, applies for the most part to metal, since the effects are more easily attained thus than when it is applied to porcelain; specimens of the latter sort being, indeed, chiefly regarded as curiosities. In Cloisonné work (so-called from *Cloison*, a partition), fine metallic walls of the same material as the basis (for example, copper) are soldered by a strong cement by one edge to the basis; and these walls in this manner form numerous cells or compartments, in which the vitrifiable enamel pastes of various colors are placed. The enamel is then vitrified by several firings — three or four generally being required before enough enamel can be applied to afford an approximately level surface — and subsequently is ground and polished to a high degree. The Gauls in Roman times and previously made cloisonné, and it was employed for decorative purposes in shrines, altar-pieces and church plate in the Middle Ages. It has not since been used until recent experiments were attempted. The Oriental cloisonnés are well known, particularly the Japanese. The art is said to have been introduced into Japan from China in the 16th century of the Christian era. Japanese cloisonné is made chiefly at Owari, Kioto, Tokio and Osaka. In later specimens of the Japanese work the partitions are reduced to a minimum, apparently making no separation between the color masses of the enamel. The finest examples of the Oriental cloisonnés display great brilliancy. See Ceramics.

CLOISTER (O. F. *cloistre*, Lat. *claustrum*, bar, enclosed place), a court enclosed by covered walks. The latter are, strictly speaking, the cloisters, the central space being termed the cloister garth. The walks, or ambulatories, are open on the side toward the garth and when appertaining to monastic or collegiate establishments were intended for the use of monks or nuns or the clergy attached to the church. The cloisters are usually, though not invariably, placed on the south side of the church. They are commonly square on the plan, having a plain wall on one side, a series of windows between the piers or columns on the opposite side and covered with a vaulted or ribbed ceiling. They form part of the passage of communication from the church to the chapter-house, refectory and other parts of the establishment. The chapter-house usually opens from the east walk, the refectory and certain other domestic buildings of a monastic house from the south walk. Sometimes there was a second story, but these have rarely been preserved. Both the Romanesque and Gothic types prevail. Germany presents some fine examples of the former style of architecture at Maulbronn and Heiligenkreuz. In southern France the same type is seen in the monasteries at Arles and Velay. In Italy the Gothic arched cloister with its ornate pillar groups often varied with enameled and mosaic decorations are found at Salerno, Palermo, Amalfi. The later Roman school developed a form exquisite in delicate carvings of which a good example is to be found at the Lateran. France furnishes some very interesting examples, notably that of Mont Saint-Michel (q.v.) on the coast of Normandy where the great cloister is built on the roof of a vaulted chamber, since the building itself is constructed on the top of a sheer, almost perpendicular, rocky height. Spanish cloisters are of both types,— the royal convent of Huelgas near Burgos, of the arcaded form, is remarkably beautiful. Greatest elegance of form is attained in those of Monreale and Cefalu in Sicily. In England the Gothic form is to be seen at Gloucester, Hereford, Norwich, Westminster and Canterbury. Several important colleges also have such ambulatories such as Eton and Winchester, Magdalen at Oxford and Christ Church.

Cloisters were used as places for quiet walks and contemplation; parts for lectures, education, study and recreation. Lavatories, or sometimes large fountains were often provided in extensions of the ambulatory, so that the monks might wash before going to meals. The garth was usually a plot of grass accessible in only a few places by means of gaps in the low walls of the arcade.

CLOISTER AND THE HEARTH, The. Charles Reade's 'The Cloister and the Hearth' (1861), like George Eliot's 'Romola' (1863), is a very great historical novel dealing with the Renaissance. George Eliot confines her theme to Italy, making a profound psychological study of a few typical characters. Charles Reade gives a broad picture of the life of the period not only in Italy but in France, Germany and especially Holland. Each novelist is supreme in the field chosen.

The events of Reade's novel are supposed to have occurred toward the close of the 15th century. The hero is one Gerard Eliassoen, a Dutch boy of humble birth, who displays in his youth a wonderful talent as a copyist and illuminator of Latin and Greek manuscripts. He is desperately in love with Margaret Brandt, the beautiful daughter of a physician — half alchemist, half magician. The lovers are formally betrothed, but their marriage is prevented, and Gerard flees to Rome, the centre of the new art and learning, with the intention of returning to Margaret after his fortune has been made and his fame has been established. The long journey to Rome on foot through dense forests infested with wolves and robbers, the association with other travelers met or overtaken by the way, the motley groups encountered at inns, and the varied life of the Eternal City, enabled the author to unfold a panorama such as fiction had never known. All the picturesque elements of the Renaissance are in Reade's novel. In his pages we see, too, just how the people lived, what they did, what they thought, amid the uncertainty and turmoil when ancient ideas were coming into conflict with the ideals of the mediæval church. There is the household of a Dutch shopkeeper in contrast with the sumptuous court; the village curate, the hermit, the great monasteries and the great unfinished churches with nave and chancel open to the sky, and Dominican friars traversing the banks of the Rhine and preaching to the people. We witness the cruel administration of the law, we see the wheel and the rack and gibbets, from which dangle robbers hung by the neck. There is a thrilling escape from the tower of a prison, and a desperate encounter with bears, and a castle stormed and besieged, and a shipwreck — all in the mediæval style of wild adventure.

The world is in utter confusion. The bow and arrow are still used, but gunpowder is coming in; manuscripts are copied and illuminated, but books have been printed in a strange new manner. There is no faith; there is only superstition, fanaticism and sorcery. The Pope has written an indecent novel; the ritual of the Church is only a revival of pagan worship in a new form, and the scholar in the presence of cardinals denounces the Church and lauds Greek hedonism above all else. Finally, the deep tragedy of the age is depicted in the story of the lovers. While in Rome, Gerard hears that Margaret is dead, and, hopeless of further happiness in this world, he becomes a Dominican friar. And then he returns to Holland and finds that she is still alive and the mother of a boy. But there can now be no life together, for he has given himself to the Church, which permits no union between the cloister and the hearth. The beauty, the conduct and the temper of Margaret are beyond all praise. There is no finer feminine character in fiction. The golden-haired son of Margaret and Gerard lived to be Erasmus, the great scholar and divine whose name soon resounded through the Western world. With Erasmus dawned a new civilization.

WILBUR L. CROSS,
Professor of English, Yale University.

CLONMEL, Ireland (Gælic, "Vale of Honey"), a municipal borough situated on both sides of the Suir, a part in Tipperary and a small part in Waterford, and 90 miles southwest of Dublin. Three stone bridges cross the Suir and connect the parts of the town; it has good streets, well paved and well lighted. Clonmel was founded by the Danes and has long been noted for its love of learning. The fame of the schools established by the Franciscans in the 13th century extended to all the seats of learning on the Continent. Traces of its old walls demolished by Cromwell in 1650 remain. The chief edifices now in the town are an Episcopal church, two Roman Catholic churches, a Franciscan abbey, the courthouse, jail, barracks, free library, town-hall, convents, schools, lunatic asylum, etc. The trade is chiefly in grain, cattle and provisions; and there are flour mills, creameries, a brewery, etc. Laurence Sterne, the novelist, was born in Clonmel, and Lady Blessington, the writer, was born nearby. Pop. 10,209.

CLONTARF, Ireland, suburb of Dublin, in Dublin County, three miles northeast of Dublin, on Dublin Bay. It contains many handsome villas and is much frequented during the summer months for sea-bathing. Clontarf is famed in Irish history as the scene of the overthrow of the Danish power in Ireland by Brian Boroimhe on 23 April 1014. Pop. about 4,800.

CLOOTS, klōts, **Jean Baptiste von,** Prussian baron, well known during the Revolutionary scenes in France under the appellation of Anarchist Cloots: b. Gnadenthal, near Cleves, 24 June 1755; d. 24 March 1794. He became possessed of a considerable fortune, which he partly dissipated through misconduct. He was educated in France and traveled in different parts of Europe and formed an acquaintance with many eminent individuals, among whom was the celebrated Edmund Burke. At the age of 21 he returned to France and published an attack on revealed religion entitled 'Certitude des preuves du Mohamétisme.' The first work in which he distinguished himself was the ridiculous masquerade called the 'Embassy of the Human Race,' partly contrived by the Duke de Liancourt. On 19 June 1790, Cloots presented himself at the bar of the National Assembly, accompanied by a considerable number of enthusiastic followers from the slums of Paris dressed to represent the various nationalities, English, German, Italian, Spanish and others. He described himself as the orator of the human race and demanded the right of confederation, which was granted him. To show his democratic spirit he abandoned his title and rank (but not his income). At the bar of the Assembly, 21 April 1792, he made a strange speech, in which he recommended a declaration of war against the king of Hungary and Bohemia, proposed that the Assembly should form itself into a diet during a year, and finished by offering a patriotic gift of 12,000 livres. On 12 August he went to congratulate the Legislative Assembly on the occurrences of the preceding 10th, and offered to raise a Prussian legion, to be called the Vandal Legion. The 27th of the same month he advised the assembly to set a price on the heads of the king of Prussia and the duke of Brunswick, praised the action of John J. Ankarstrœm, the assassin of the king of Sweden, and, among other absurd expressions, he said, «My heart is French and my soul is sansculotte.» He displayed no less hatred to Christianity than to royalty. In September 1792 he was nominated deputy from the department of the Oise to the national convention, in which he voted for the death of Louis XVI «in the name of the human race.» He became an object of suspicion to Robespierre and his party, was arrested and condemned to death. He published several works, the chief of which are 'L'Orateur du genre humain' (1791); 'Base constitutionelle de la république du genre humain' (1793). Consult Avenel, 'Anacharsis Cloots, l'orateur du genre humain' (Paris 1865); Bax, 'Outlines from a New Standpoint' (London 1891).

CLOSE TIME, a period of the year during which certain animals are protected by law, and are not allowed to be caught or killed. Such animals are chiefly those that are killed for food or sport, and include birds, fishes and quadrupeds, as well as certain others — crabs, lobsters and oysters, for example.

CLOSURE (often needlessly *clôture*, the same word in French), the European substitute for the American «previous question»: the power of shutting off debate when the speaker or the majority think it has exhausted legitimate argument and is used for mere obstruction. As the equity of neither deciding power can be guaranteed, it is also a possible weapon of mere «gag-law»; but it has shown itself to be the only method in which parliamentary institutions can be worked. In Congress the «previous question» has existed in the House for many years, but because of its smaller size the Senate did not consider such a rule necessary until the closing hours of the 64th Congress, which terminated 4 March 1917. The filibustering tactics of the «little group of wilful men» had prevented the passage of the armed ship bill prior to adjournment, wherefore on 8 March 1917 the special session of the Senate passed a closure rule making possible the limitation of debate. The rule provides:

> "That if at any time a motion signed by sixteen Senators to bring to a close the debate upon any pending measure is presented to the Senate the presiding officer shall at once state the motion to the Senate and one hour after the Senate meets on the following calendar day but one, he shall lay the motion before the Senate and direct that the secretary call the roll and upon the ascertainment that a quorum is present, the presiding officer shall, without debate, submit to the Senate by a yea and nay vote the question: 'Is it the sense of the Senate that the debate shall be brought to a close?'
>
> "And if that question shall be decided in the affirmative by a two-thirds vote of those voting, then said measure shall be the unfinished business to the exclusion of all other business until disposed of.
>
> "Thereafter no Senator shall be entitled to speak in all more than one hour on the pending measure, the amendments thereto and motions affecting the same, and it shall be the duty of the presiding officer to keep the time of each Senator who speaks. Except by unanimous consent no amendment shall be in order after the vote to bring the debate to a close, unless the same has been presented and read prior to that time. No dilatory motion, or dilatory amendment, or amendment not germane, shall be in order. Points of order, including questions of relevancy and appeals from the decision of the presiding officer, shall be decided without debate."

In the British Parliament no such rule existed till 1882, debate being unlimited; and the fairness of its members, and their unity of feeling as Englishmen, had prevented any serious ill results. But about 1872 Isaac Butt, the leader of the Irish Home Rule party, began the policy, carried on after his death by Parnell, of putting a stop to all legislation on English subjects until all Irish demands had been granted, by talking against time, making irrelevant motions, calling for divisions on every motion, etc. For many years Parliament struggled under this, extremely loath to tie down the immemorial freedom of debate, but was finally forced to act, and in 1882 passed a «closure» rule, which allowed the speaker, on request of 40 members, to pronounce debate closed and call for a vote. In 1902 the present rule was adopted, providing that upon the proposal of a question a member might move that the question be put and if the rules be not abused by such a motion and the rights of the minority be not infringed, then the question should be put at once and decided without further debate or amendment. In 1887, in order to shut off debate on the Irish Crimes Act, the House of Commons, owing to the ineffectiveness of the closure rule, employed a measure known as the «guillotine.» Debate on only four out of the 20 clauses had consumed 27 days, wherefore a motion was adopted providing that at the end of the following week the chairman, without further debate, should put the questions necessary to end the committee stage. Because of its severity, the procedure became known as the «guillotine.» In 1893, in connection with the Home Rule Bill, «closure by compartments» was adopted, under which debate on certain clauses should cease on a specified date, debate on certain other clauses should cease on another specified date, and in this way to the end of the measure under discussion. The French *clôture* dates from Louis Napoleon's *coup d'état* in 1851. See PREVIOUS QUESTION; PARLIAMENTARY LAW; LEGISLATIVE BODIES, RULES GOVERNING. Consult Cushing, L. S., 'Law and Practice of Legislative Assemblies' (Philadelphia 1907); Hinds, A. C., 'Digest and Manual of the Rules and Practice of the House of Representatives' (Washington 1908); Lowell, A. L., 'The Government of England' (rev. ed., New York 1912); May, Sir T. E., 'A Treatise on the Law, Privileges, Proceedings and Usages of Parliament' (12th ed., London 1917).

CLOTAIRE, klō-tär, I, son and successor of Clovis (q.v.), first king of the Franks in Gaul, reigned as sole king from 558 to 561. CLOTAIRE II, a king of the same Merovingian dynasty, reigned over the Franks 30 years later.

CLOTH. See WEAVING.

CLOTHES MOTH, a moth (*Tinea pellionella*), of the family *Tineidæ*, in which the wings are long and narrow, pointed at the end, and with a long finger. It is pale buff-yellow, with no definite markings. It may be seen flying about the house the last of May, or still earlier if the weather be warm, when it lays its eggs in woolens and furs. The young caterpillar is whitish, and begins, on hatching, to construct a flattened cylindrical case in which it lives, dragging the case about with it. The mischief is done by the worm, the caterpillar working through the next 10 months, finally changing to a pupa in its case. The carpet-moth belongs also to this group. There is a straw-colored species *Tinea bisselliella,* which spins silk over its food, but does not make a case. A cocoon is spun before pupation out of fragments of cloth. The best preventative is cold storage at a temperature of 40° F., or the use of naphthalium or camphor. Woolen garments should be carefully brushed and put away in cotton sacks or in camphor trunks, or wrapped tightly in stout paper, or stored in large pasteboard boxes rendered tight by gumming a strip of wrapping paper around the edge, so as to seal the box completely. Consult Packard, 'Guide to the Study of Insects'; Howard and Marlatt, 'The Principal Household Insects of the United States' (in *Bulletin* 4 of the United States Department of Agriculture).

CLOTHING. See Costume; Dress.

CLOTHING INDUSTRY IN AMERICA. As shown by the 1914 census of manufactures in the United States, the value of the factory product of clothing exceeded that of all other industries except three, which, in order of magnitude, were iron and steel, slaughtering and meat packing and foundry and machine-shop products. Of the total for the clothing industry, $1,297,273,396, the value of clothing for men and boys was $458,210,985, or 35.3 per cent; clothing for women and children, $473,888,354, or 36.5 per cent; shirts, collars and other furnishings, including corsets, $122,440,522, or 9.4 per cent. Census statistics for these branches of the industry are shown in an accompanying table. Clothing for women and children and for men and boys, classified as two industries, ranked among all industries in 1914 seventh and eighth, respectively, in number of wage earners, and 13th and 12th, respectively, in value of product.

Clothing manufacturing is peculiarly an American industry. By far the greater quantity of the clothing worn in the United States is factory-made. All classes of people in this country buy more clothes and are better dressed than corresponding classes in other countries. In Europe clothing factories are comparatively few and small. Only a limited amount of special lines of clothing is imported into the United States. The statistics of imports and exports during the fiscal year ended 30 June 1914, a month before the war in Europe began, are: Wearing apparel of wool, imports, $2,268,125; exports, $2,148,235. Wearing apparel of cotton, except hosiery and other knit goods, imports, $2,898,167; exports, $8,220,626. Wearing apparel of silk, imports, $4,246,345; exports, $11,673.

Clothing produced in European factories does not equal the American product in style except for women's outer apparel. Models of women's dresses, suits and cloaks are brought from Paris. In other lines the styles of clothing worn in the United States originate with American style designers, though occasionally suggestions from Europe are adopted. The styles of clothing for men in America are determined by designers in large factories, rather than by custom tailors. Clothing manufactures are the most extensive advertisers in this country. The styles of factory designers are attractively illustrated in newspaper and magazine advertising, and factory-made garments have been greatly popularized by this wide publicity. The best grades of factory clothing, though sold for much less than the handiwork of custom tailors, is well tailored and compares favorably with it. The factory-made clothing industry has grown at a much more rapid rate than the population. The increase from 1900 to 1910 in the population of the continental United States, Alaska excluded, was 21 per cent, while the increase from 1899 to 1909 in the value of product was: clothing for men and boys, 75.5 per cent; for women and children, 142.1 per cent.

Before ready-to-wear clothing was manufactured, clothing was made in the home or by tailors, who often were itinerant. Dealers in second-hand clothing supplied to some extent the demand for cheap apparel. The necessity for replenishing the clothing of sailors during their few days in port led to the manufacture of ready-made clothing at New Bedford about 1825 and at Boston about 1830. Production on a larger scale was begun about 1831 by George Opdyke, later mayor of New York, who had a store in that city, with a branch in New Orleans. About 1834 his son-in-law, John D. Scott, moved from New Jersey to New York city, to take charge of the clothing factory, and thereafter the name of the firm was John D. Scott & Co. They had a large Southern trade, and soon opened branch stores in Charleston and Memphis. They supplied clothes for planters, but their product was mostly garments of cheap materials for slaves on plantations. Other men, some of them merchants, began manufacturing clothing for sailors, for Southern negroes and, after 1848, for gold miners in California. Not a large amount was made for other classes before 1861. Until then the factories were principally in New York, Boston, Philadelphia and Baltimore, near the textile mills, and where a labor supply was obtainable, but some were in Rochester, Cincinnati and other cities. The cutting was done in the shops or factories, but many of the garments were made up in the homes of the workers. Some were sent to rural communities to be made up by females in the families of farmers during winter or in any spare time.

The Civil War gave a great impetus to the industry. Manufacturers lost their Southern trade, but secured large government contracts, and many new factories were started to supply army uniforms. Sizes of clothing were standardized by measurements that the government furnished, and these measurements were used in making clothing for civilians after the war. The requirements of the soldiers who returned to civil life in 1865, the re-establishment of Southern trade, the increase of immigration and the very rapid development of the West led to a large expansion of the industry. In the seventies and eighties small merchants, clerks, teachers and men of other classes, who wished to wear clothes of good appearance but could not afford to patronize custom tailors, began to buy factory-made clothing. Only a few factories now make separate trousers, the demand being for suits of the same material. Formerly manufacturers sold mostly to jobbers, but now nearly the whole output is sold directly to retailers. By 1907 tailor-to-the-trade houses were established. They make suits from measurements forwarded by merchants whose customers have made selection from swatch samples and stylebooks. Mail order houses sell both ready-made clothing and made to order suits.

The industry could not have grown to its present magnitude without the invention of many labor-saving machines and devices. Production was greatly increased by the sewing machine, which, patented by Howe in 1846, was introduced in this industry about 1850. By 1855 10 important improvements were patented, for making chain or lock stitches, with two or more threads, and one for working button holes. The speed, 800 to 900 stitches a minute, was about doubled when mechanical power was applied, and by 1900 was increased to 4,000 stitches per minute. There are now special machines or attachments for serging, felling, binding, seaming, seam-closing, two-row stitching, blind stitching, canvas front making, collar and lapel padding, sleeve inserting, button holing and button sewing. While most operations formerly done by hand are now done by machines, hand work is still considerably employed in felling and some other operations on the better grades of factory product. The first tool besides shears for cutting was a long knife, which, introduced about 1870, is still used for cheap garments. Pushed up and down through a slot in a table, it cuts many layers of cloth. The first power cutting machine, introduced in 1872, had a reciprocating blade, and soon afterward a belt cutter was invented. Machines, electrically operated, that could be pushed about the cutting table to follow pattern marks, were introduced in 1892. One variety with a circular knife cuts a maximum of three inches of cloth, and one with a reciprocating knife cuts six to eight inches. Shears are still used for cutting the better grades of clothing. In large factories linings are laid on the cutting table by an automatic laying machine. Ordinary irons were formerly used for pressing and still are for coats of the better grades. Irons heated from within by gas from a rubber tube were introduced about 1903, and pressing machines about the same time. A machine operated by a pedal was followed by a more powerful machine operated by steam.

Still another important factor in the development of the industry has been the adoption of more efficient methods of manufacturing. Before the Civil War, one worker usually made an entire garment by hand or by hand and machine. After factories were enlarged to make army uniforms subdivision of labor was introduced. The work has been divided more and more, so that now the operations in making a coat number from 30 to 60 or more. This subdivision, by which each worker does only one small separate operation, permits the employment of less skilled labor, and thus increases, as well as cheapens, production. Only by a minute subdivision could manufacturers have utilized the hordes of unskilled immigrants after 1880.

Before, during and after the Civil War, the making of garments after cutting was largely done under the contract system and the workers were employed for long hours at low pay. For 10 years after 1882, when large numbers of Russian Jews entered the industry, sanitary conditions in the shops were at their worst. Immigrants slept, cooked, ate and worked in small, dirty, foul-smelling rooms, without adequate ventilation or sanitary requisites. These places were usually called sweat-shops. The evils of such conditions were remedied in New York city, the most congested clothing centre, by the Tenement House Act of 1892, which prohibited contractors from manufacturing in their homes. Manufacturers adopted trademarks and began extensive advertising campaigns. The money thus spent was wasted unless the product was of uniform quality. Manufacturers, therefore, gave closer attention to the work done in the shops of their contractors. In many cases one of the lofts in the factory building was rented to the contractor, and this practice continues, a shop so situated being called an inside shop. To secure better workmanship, the contract system has been more and more abandoned, and in many of the larger factories all work is done under one roof by labor that the manufacturer directly employs. In Rochester splendid clothing factory buildings have been erected, and in the larger cities there are now factory buildings with all needful sanitary arrangements. Of the 4,830 establishments making clothing for men and boys in 1914, the 2,331 regular factories had 123,939 wage-earners and the 2,499 contract shops had 49,808. Corresponding figures for establishments making clothing for women and children were: regular factories, 4,470, with 151,950 wage-earners; contract shops, 1,094, with 16,957. Of the 510,595 wage-earners in the whole clothing industry, reported by the 1914 census of manufacturers, the males and females 16 years of age and over were respectively 36.1 and 62.6 per cent; and workers under that age, 1.3 per cent. Women, who operated sewing machines exclusively, were gradually supplanted as operators to a large extent by Hebrew men who, in the early 80's, began to come in large numbers from Europe. Women are still largely employed for hand-finishing, which consists mostly of felling. Cutters and pressers have always been men. Few children have ever been employed in the industry. During recent years working conditions have been greatly improved, partly through legislation and partly by agreements of labor unions with manufacturers or manufacturers' associations. Working-day hours have decreased and sweat-shops practically no longer exist. Of the wage-earners in the whole industry, those that worked where the prevailing hours of labor per week were 54 or less were 58.1 per cent in 1909 and 90.2 in 1914. Despite the decrease in working hours, the earnings of employees have increased. In all branches of the industry nearly all employees are paid for piece-work, instead of wages, and they, as well as the manufacturers, prefer the piece-work system, mainly because the workers differ so greatly in skill and speed.

The first census record of clothing manufactured for men and boys was for 1849, the first record of clothing for women and children was for 1859. Garments made by dressmakers constituted the women's clothing shown by the records for 1859 and 1869. Factory production of cloaks began about 1870 and of women's suits, dresses, waists and skirts about 1880. After 1890, the manufacture of these garments increased at a wonderfully rapid rate. In 1914, the value of the factory product of clothing for women and children surpassed that of clothing for men and boys. In both branches of the industry the factory, shop and working conditions have been about the same and similar machinery has been used. In the manufacture of clothing for women and children there is less subdivision of labor and more hand-work than in the manufacture of clothing for men. Most of the factory-made clothing manufactured in the United States is produced in New York city, and nearly three-fourths in the State of New York. Corsets are manufactured principally in Connecticut and New York city. While models for styles of women's outer apparel have been mostly imported from Paris, many new designs have, in recent years, originated in America. All muslin underwear manufactured in the United States is of domestic designs.

Clothing Industry in the United States — Principal Branches

Clothing for Men and Boys

Census Year	Establishments	Wage earners	Wages	Cost of materials	Value of product
1849	4,278	96,551	$15,032,340	$25,730,258	$48,311,709
1859	4,014	114,800	19,856,426	44,149,752	80,830,555
1869	7,858	108,128	30,746,579	86,794,706	148,660,253
1879	6,166	160,813	45,940,353	131,363,282	209,548,460
1889	4,867	144,926	51,075,837	128,846,857	251,019,609
1899	5,729	120,927	45,496,728	145,218,798	276,717,357
1904	4,504	137,190	57,225,506	185,793,436	355,796,571
1909	5,584	191,183	89,644,921	252,522,567	485,677,493
1914	4,830	173,747	86,828,011	230,031,690	458,210,985
Clothing for Women and Children					
1859	188	5,739	1,193,032	3,323,335	7,181,039
1869	1,847	11,696	2,513,956	6,837,978	12,900,583
1879	562	25,192	6,661,005	19,559,227	32,004,794
1889	1,224	39,149	15,428,272	34,277,219	68,164,019
1899	2,701	83,739	32,586,101	84,704,592	159,339,539
1904	3,351	115,705	51,180,193	130,719,996	247,661,560
1909	4,558	153,743	78,568,261	208,788,226	384,751,649
1914	5,564	168,907	92,573,642	252,345,040	473,888,354
Shirts for Men and Boys					
1879	549	25,687	5,403,696	11,306,444	20,130,031
1889	869	31,207	9,193,495	15,704,343	33,638,593
1899	690	36,622	10,894,327	22,950,564	47,121,530
1904	641	36,499	11,233,392	25,639,402	50,971,105
1909	770	48,513	16,632,398	44,992,879	82,399,142
1914	792	51,972	19,169,697	50,148,535	95,815,013
Collars and Other Men's Furnishings					
1879	161	11,174	2,644,155	6,500,164	11,506,857
1889	586	20,778	6,078,026	15,280,572	29,870,946
1899	457	30,322	9,730,066	23,669,929	44,346,482
1904	547	27,185	8,760,108	26,564,500	49,031,582
1909	900	38,482	15,092,988	49,124,843	87,710,197
1914	802	42,205	17,185,752	52,864,625	95,416,932
Corsets					
1879	113	8,802	1,745,969	3,686,821	6,494,705
1889	205	10,928	3,509,039	5,662,140	12,401,575
1899	138	12,297	3,644,593	6,357,189	14,451,198
1904	109	10,975	3,600,462	6,135,237	14,862,081
1909	138	17,564	6,464,144	15,640,415	33,257,187
1914	167	20,496	7,976,721	19,427,362	40,550,702

The wife of a blacksmith in Troy, N. Y., is credited with having invented separate collars for shirts. It occurred to her that she would not need to wash and iron her husband's shirts so often if the collars were detached. She began to make separate collars for him about 1825 and to make them for sale a little later. Ebenezer Brown, a small dry-goods dealer in Troy, began, about 1829, to sell separate collars made by members of his family. They were called "string collars," because they were tied around the neck with tapes attached to the ends. By 1840 five other collar-making shops were started in Troy. To this day the collar business is largely centred there. The business is probably more localized than any other of the same magnitude in the United States.

The first shirt factory of which there is a record was owned by David and Isaac N. Jordan, merchants in New York city. They frequently received from the South orders for shirts which they employed seamstresses to make. In 1832 they started a factory for making stock shirts. In 1840 another firm in New York city began manufacturing shirts, and in 1845 a shirt factory was opened in Troy. At the present time the production of shirts in Troy about equals that in Philadelphia or Baltimore, and the production in these three cities about equals that in New York city.

WALTER B. PALMER,
Formerly Special Agent, Bureau of Foreign and Domestic Commerce.

CLOTHO, one of the three Fates (q.v.). In zoology, Clotho is a genus of snakes of the tribe *Viperina*, family *Viperidæ*. *C. arietans* is the puff-adder of the Cape of Good Hope. In astronomy, Clotho is the name of the 97th asteroid, discovered by Tempel 17 Feb. 1868.

CLOTILDA, Saint, the daughter of Chilperic, King of Burgundy: b. about 475; d. Tours 545. In 493 she became the wife of Clovis, king of the Franks. She was the chief means of securing the conversion of her husband to Christianity, and largely influenced his life. After his death she lived a life of austerity at Tours. She was canonized a few years after her death. Her remains were buried in the church of Saint Géneviève at Paris, and burned at the Revolution to prevent their desecration; the ashes are still in the church of Saint Leu. There is a statue of her in the Luxembourg and a fine church was built in her honor in Paris about 1850. Consult Kurth, 'Sainte Clotilde' (Paris 1905).

CLOTTING. See PATHOLOGY.

CLÔTURE, klō-tür. See CLOSURE.

CLOUD, Saint, or CLODOALD, son of Clodomir and grandson of Clovis, King of France. After the death of his father and the murder of his two brothers he became a monk and found refuge in a monastery near Paris, which took from him the name of Saint Cloud. He died there in 560.

CLOUD, Virginia Woodward, American author: b. Baltimore. She was educated in private schools in Baltimore, is unmarried and has been a writer by profession since 1893. She is literary editor of the Baltimore *News* and member of the board of managers of the Woman's Literary Club. Her publications include 'Down Durley Lane' (1898); 'A Reed by the River' (1902), and 19 connected tales of the Revolutionary and Colonial periods; character studies of women, now republished in many collections of readings; a trilogy of connected tales; novelettes; also the 'O'Tara Stories,' published in *Harper's Weekly* and *Uncle Remus's Home Magazine,* and many stories, poems, etc., in leading magazines. She is represented by portrait and poems in the Bibliothèque Nationale of France.

CLOUDBERRY, a plant (*Rubus chamæmorus*) called also knobberry, mountain bramble and mountain raspberry, is found in peatbogs and swamps from Maine and New Hampshire westward and northward to Alaska. The plant is of humble growth, the leaves few, large-lobed and kidney-shaped, the flower large and white, the fruit orange-red and of an agreeable flavor. It is a native of the northern parts of America, Europe and Asia. In Great Britain it is chiefly confined to elevated moors. In Norway and Sweden it is much more abundant; the fruit is highly valued and makes excellent preserves. In Canada it is abundant in the north and greatly prized in Newfoundland, Labrador, Nova Scotia and northern Quebec. It is difficult of cultivation. Similar to it is the *Rubus geoides,* whose fruit is as large as a raspberry and one of the few native fruits of Tierra del Fuego and the Falkland Islands.

CLOUDBURST, a sudden and violent rainfall, covering a limited territory and of brief duration. The term generally connotes six or more inches of rainfall and at the rate of 10 or more inches per hour. The area covered by the heavy rains is probably not more than an acre; or not more than a square mile by the lighter storms. It occurs in the hottest season and most frequently on the slopes of mountains and in arid regions and is generally accompanied by severe and continuous lightning. The cloud-burst is caused by the contact of a warm current of air, surcharged with moisture, with a cold current, the result being swift condensation and immediate precipitation of the water formed. Consult Ferrel, 'Recent Advances in Meteorology' (Washington 1886), and his 'Popular Treatise on the Winds' (New York 1889); Hahn, 'Lehrbuch der Meteorologie' (pp. 361–70, 1st ed., Leipzig 1901).

CLOUDS, masses of minute globules of water or crystals of ice and snow suspended in the atmosphere.

The minute globules of water that make the cloud are evidently condensed from the invisible moisture that is always present in the air in greater or less quantities. The studies of Aitken, J. J. Thompson, Wilson and others have thrown considerable light on the processes of condensation. It pure, dry air — that is, air from which all dust and traces of electricity have been removed — be mixed with pure vapor of water and the moisture be cooled below the temperature of saturation, it will be found that condensation of water vapor does not generally occur. If, however, fine dust be injected into the pure mixture without altering its temperature or pressure, a fine mist is developed at once. It has also been discovered that if a charge of electricity, however small, be introduced, condensation takes place at once. From these experiments it is inferred that nuclei of some sort, such as dust particles or electric particles, are necessary for the formation of water globules, other conditions being favorable.

The original classification of clouds by Howard in 1803 took account of form only. A more recent classification — the one now in general use — takes account of both the form of the cloud and its altitude. In this system three principal forms are recognized, namely, cirrus, cumulus and stratus, with their modifications. These three main classes present the most obvious differences in form and shape; they develop at widely different altitudes and move with varying velocities. It is possible to further subdivide each class into a number of varieties, and in practice this is done when an observer becomes skilled in distinguishing the special forms and subdivisions of the main types.

The definitions of the principal types as recommended by the International Cloud Committee, and generally adopted by meteorologists, are given below.

Cirrus (Ci.).— Isolated feathery clouds of fine fibrous texture, generally of a white color, frequently arranged in bands, which spread like the meridians on a celestial globe over a part of the sky and converge in perspective toward one or two opposite points of the horizon. (In the formation of such bands Ci. S. and Ci. Cu. often take part).

Cirrus clouds are the highest of all and move with the greatest velocity. They develop up to a height of about 10 miles, although their mean height is a little over six miles, being higher in summer than in winter. Their average velocity in winter is about 75 miles per hour, and in summer 65 miles per hour. They may be formed by mixture of air strata of different temperatures or by the cooling of a moist streak in the upper atmosphere by expansion and radiation. In the latter case, if the surrounding air be very dry, the newly-formed cloud is soon dissipated.

Cirro-stratus (Ci. S.).— Fine whitish veil, sometimes quite diffuse, giving a whitish appearance to the sky, and called by many cirrus haze, and sometimes of more or less distinct structure, exhibiting tangled fibres. The veil often produces halos around the sun and moon.

This cloud, as its name indicates, is one of the composite forms. Its structure is much on the same order as that of pure cirrus; in fact it is generally composed of cirrus fibres tangled and interlaced in a most complex manner. The variety of forms, however, is practically unlimited and it undergoes rapid changes, especially in advance of a cyclonic disturbance. Like cirrus, it is composed of crystals of snow or ice, develops at a great elevation and moves with high velocity.

Cirro-cumulus (Ci. Cu.).— Fleecy cloud. Small white balls and wisps without shadows, or with very faint shadows, which are arranged in groups and often in rows.

This is a broken layer of cloud, of which the component masses are not fibrous, like cirrus, but more or less rounded. A second, although rather rare form of cirro-cumulus, is the mackerel sky of northern Europe. The cloudlets in this case are rounded, but not fleecy. The altitude of cirro-cumulus ranges from four to six miles and its movement, like cirrus and cirro-stratus, is quite rapid.

Cumulus (Cu.).— Woolpack clouds. Thick clouds whose summits are domes with protuberances, but whose bases are flat. These clouds appear to form in a diurnal ascensional movement which is almost always apparent. When the cloud is opposite the sun the surfaces which are usually seen by the observer are more brilliant than the edges of the protuberances. When the illumination comes from the side this cloud shows a strong actual shadow; on the sunny side of the sky, however, it appears dark with bright edges. The true cumulus shows a sharp border above and below. It is often torn by strong winds, and the detached parts (fracto-cumulus) present continual changes.

This cloud is undoubtedly formed by the condensation of water vapor in the summit of an ascending column of air. The flat base of the cloud marks the level when the condensation temperature is reached, and the upper dome-shaped summit represents the head of the air column protruding into colder space. In the temperate latitudes it is usually a cloud of the warm season and forms at an altitude of about a mile above the surface of the earth. Its average rate of movement ranges from about 20 miles per hour in summer to 30 in winter. There are many special varieties and forms of cumulus cloud.

Alto-cumulus (A. Cu.).— Dense fleecy cloud. Larger whitish or grayish balls with shaded portions, grouped in flocks or rows, frequently so close together that their edges meet. The different balls are generally larger and more compact (passing into S. Cu.) toward the centre of the group, and more delicate and wispy, (passing into Ci. Cu.) on its edges. They are very frequently arranged in lines in one or two directions.

Alto-cumulus clouds may occur when the ascending currents are not strong enough or do not persist long enough to form thick cumuli, or they may represent the vapor that is condensed in the upper portion of a series of atmospheric waves as suggested by Von Helmholz. The alto-cumulus level ranges from one and a half to two miles. It is higher than the cumulus level, although the summits of cumulus clouds often penetrate into and above it. The mean velocity of alto-cumulus clouds is about 40 miles per hour, being somewhat higher in winter and lower in summer.

Cumulo-nimbus (Cu. · N.).— Thunder cloud; shower cloud. Heavy masses of clouds, rising like mountains, towers or anvils, generally surrounded at the top by a veil or screen of fibrous texture ("false cirrus") and below by nimbus-like masses of clouds. From their base generally fall local showers of rain or snow, and sometimes hail or sleet. The upper edges are either of compact cumulus-like outline, and form massive summits, surrounded by delicate false cirrus, or the edges themselves are drawn out into cirrus-like filaments. This last form is most common in spring showers. The front of thunderstorm clouds of wide extent sometimes shows a great arch stretching across a portion of the sky, which is uniformly lighter in color.

Cumulo-nimbus clouds are of massive dimensions and the most impressive of all clouds in the realm of nature. The upper surface of this cloud, which is sharp and well defined in the earlier stages of its formations, becomes soft and wispy soon after rain begins to fall from its base. The cloud itself may be divided into three planes, namely, the lower, consisting of vapor, the middle of water and the upper of ice or snow. The tops of some of these clouds reach 6 or 8 or even 10 miles into the atmosphere. Professor Bigelow computes that the temperature in one of the loftiest of these clouds ever observed fell from 79.5° F. at the ground to —74° F. at a height of nearly nine miles.

Stratus (S.).— Lifted fog in a horizontal stratum. When this stratum is torn by the wind or mountain summits into irregular fragments they may be called "fracto-stratus."

This cloud, as its name implies, is merely a horizontal sheet floating at a low elevation and without any special structure. It is generally formed by the intermingling at the surface of contact of air strata of different temperatures, and it indicates a horizontal flow of air rather than an ascensional movement in the case of cumulus clouds.

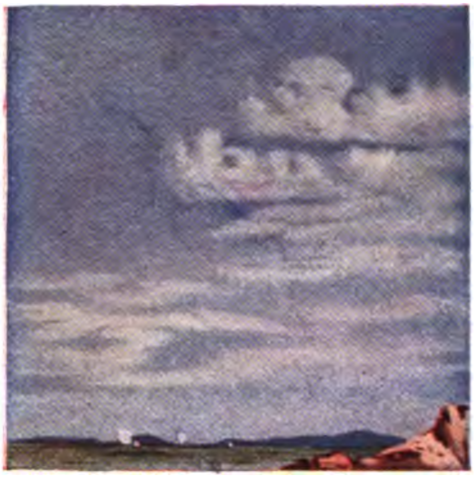
The average elevation of stratus clouds is less than half a mile and their average velocity about 15 miles per hour.

Strato-cumulus (S. Cu.).— Large balls or rolls of dark cloud, which frequently cover the whole sky, especially in winter, and give it at times an undulated appearance. The stratum of strato-cumulus is usually not very thick, and blue sky often appears in breaks through it. Between this form and the alto-cumulus all possible graduations are found. It is distinguished from nimbus by the ball-like or rolled form, and because it does not tend to bring rain.

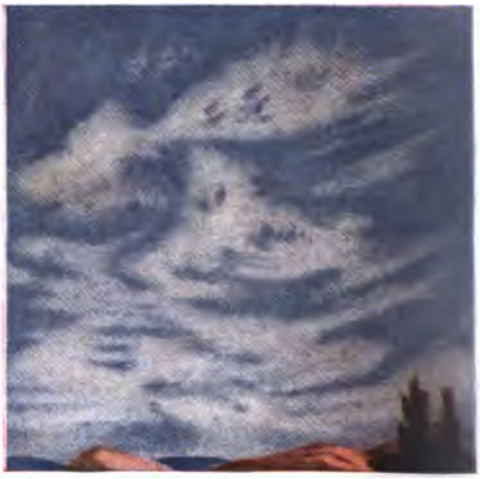
This cloud is not sufficiently uniform to be called stratus, nor sufficiently lumpy to be called cumulus. It is a cloud of moderate elevation, about 9,400 feet in summer and 7,800 feet in winter, and its rate of movement varies from 20 to 30 miles per hour. It is often a thin cloud through which patches of blue sky can be seen. Again it covers the sky completely, and presents a gentle undulating surface with a tendency to break up into long parallel rolls or bars.

Alto-stratus (A. S.).— Thick veil of a gray or bluish color exhibiting in the vicinity of the sun and moon a brighter portion, and which, without causing halos, may produce coronæ. This form shows gradual transitions to cirro-stratus, but, according to the measurements made at Upsala, was only one-half the altitude.

The average height of this cloud is about three and a half miles in summer and three



Cirrus



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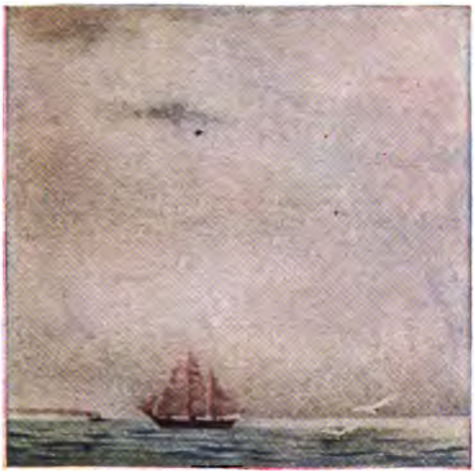
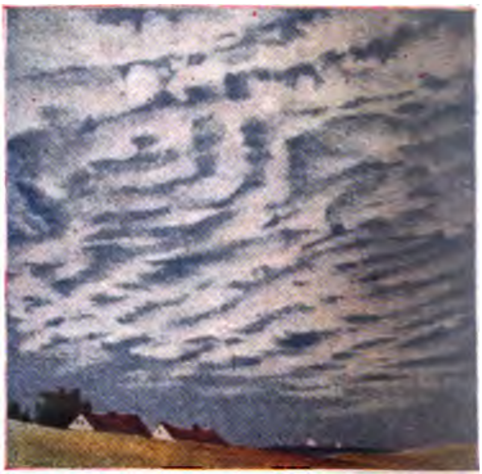
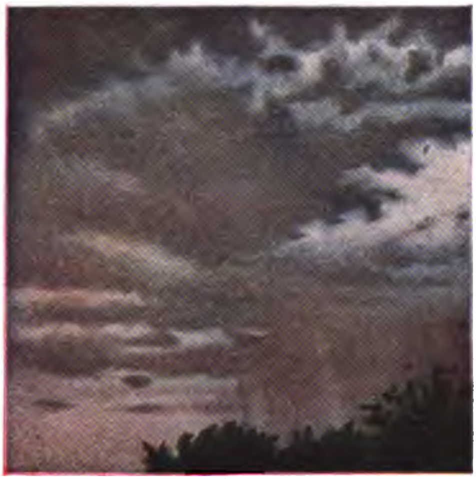


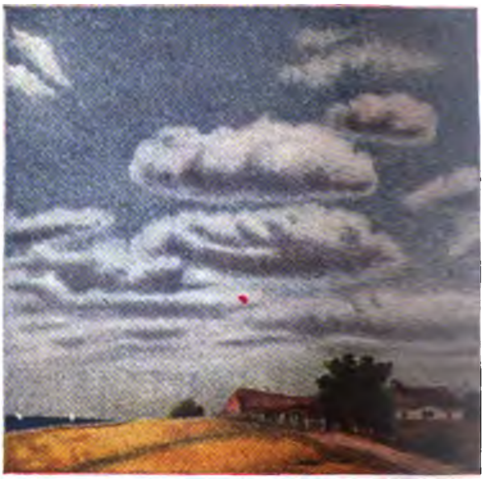
Alto-stratus



Strato-cumulus



Nimbus



Cumulus

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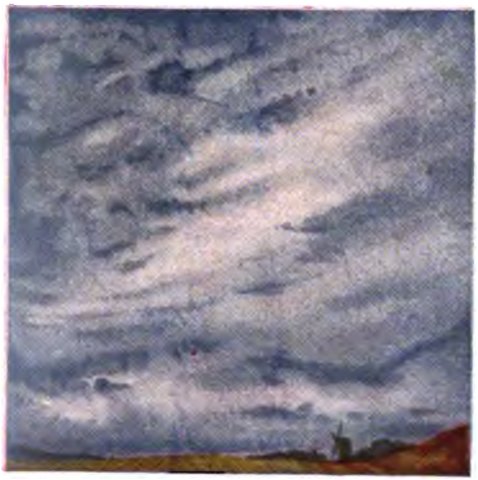
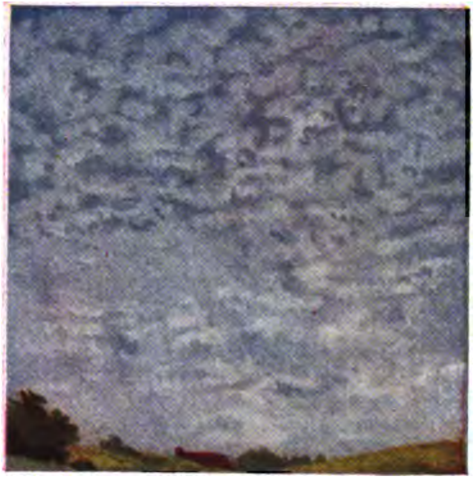
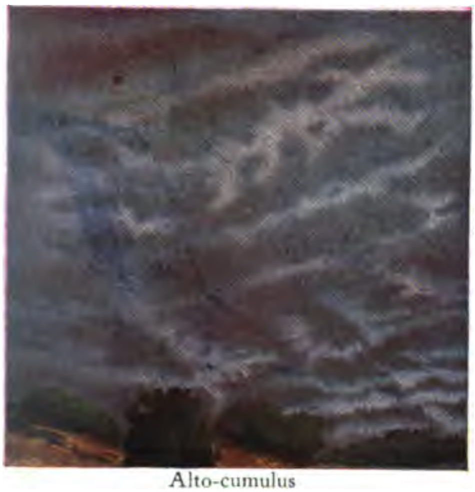

Cirro-stratus


Cirro-cumulus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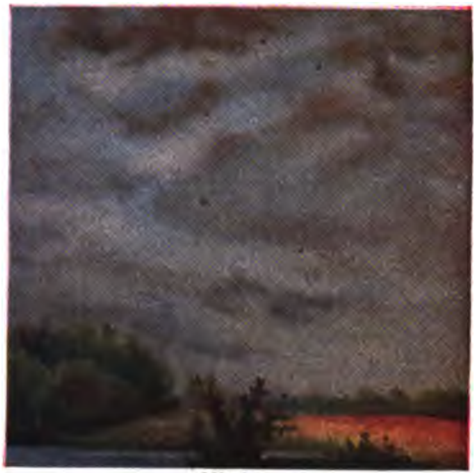
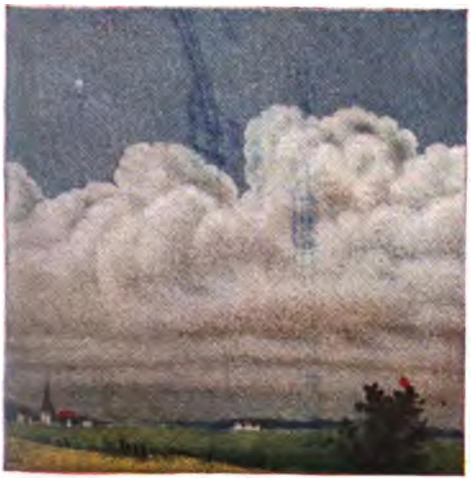
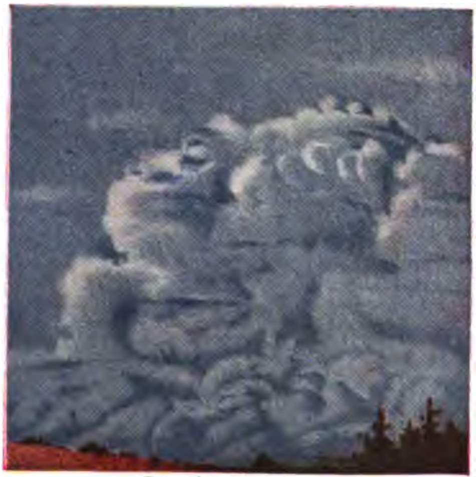

Nimbus


Cumulus


Cumulus-nimbus

miles in winter. Its average velocity ranges from 40 to 50 miles per hour.

Nimbus (N.).— Rain cloud. Dense masses of dark formless clouds with ragged edges, from which generally continuous rain or snow is falling. Through the breaks in these clouds there is almost always seen a high sheet of cirro-stratus or alto-stratus. If the mass of nimbus is torn up into small patches, or if low fragments of cloud are floating much below a great nimbus, they may be called "fracto-nimbus" ("scud" of the sailors).

As soon as rain falls from a cloud it is called a nimbus, whatever its form before the beginning of rain, with one exception, namely, when rain begins to fall from a lofty cumulus cloud it is called a cumulo-nimbus to distinguish it from a system of pure nimbus clouds, the latter being flatter and more in the nature of a sheet cloud.

Colors of Clouds.— The brilliant colors sometimes assumed by clouds at sunrise and sunset are probably caused by selective absorption and reflection of light by dust particles or vapor haze in the atmosphere. The clouds of the day-time, especially those having a great elevation, are white, since they reflect the greater part of the light incident on them.

The bases of cumuli are generally of a dark shade, while the portions in shadow are mostly of a pearl gray.

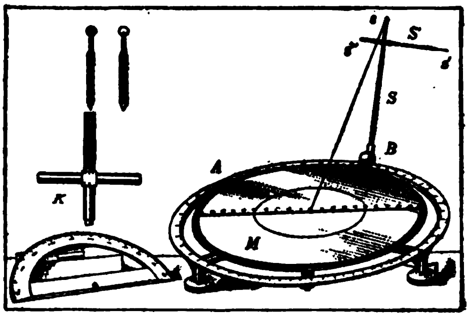
Thunder clouds sometimes have an olive-green tint, and this is thought by some observers to portend high winds and heavy rainfall.

Utilization of Clouds in Weather Forecasts.— This topic has been the subject of considerable study by Ley, Abercromby and others in Europe, and by McAdie, Clayton and the writer in the United States. In forecasting weather changes from synoptic charts the clouds frequently show the advance of a cyclonic disturbance, but not before the same information is given by the circulation of the surface winds and the fall in the barometer. Unfortunately it is not possible to fully describe and telegraph the significant features of the various cloud forms so that they may be available at a central weather station; in the case of a solitary observer, however, some skill in making local predictions of the weather may be attained by a careful study of cloud forms in connection with the barometer.

Methods of Observation.— The kind, amount and direction of clouds form a part of meteorological observations whether made for purposes of weather forecasting or for purely climatic studies. In the last-named event it is chiefly desired to know the extent of sky covered with cloud on the average of the season, since one is then able to judge of the nature of the climate with respect to sunshine. In weather forecasting it is important to know, not only the kind of cloud observed, but both its direction and apparent velocity, although in actual practice the last named is rarely attained. This information is best obtained by means of the nephoscope. An excellent form of nephoscope was devised by Prof. C. F. Marvin, United States Weather Bureau, in 1896. Professor Marvin's nephoscope is shown in the illustration.

The circular frame, A, is mounted upon three leveling screws, and its upper surface is graduated to degrees, numbered from 0 to 360, the numbers increasing in a direction contrary to the direction of motion of clock hands. The plate and mirror, M, revolve smoothly within the circular rim, A, being carried upon a hollow vertical axis at the centre. The arm, B, carrying the sighting staff, S, also revolves upon the central axis, the outer end traversing the narrow annular space between the mirror and graduated rim. The staff, S, is telescopic in construction, and is attached to the arm at B by a hinge which permits the staff to be inclined from the vertical to any extent, but always in a plane perpendicular to the mirror. The top portion of the staff is provided with a crosshead, which is surmounted by a small sighting-knob, s. The crosshead is adapted to receive the secondary staff, S', which slides with gentle friction through the crosshead, and is tipped at either end with small secondary sighting-knobs, s' and s". By reason of the telescopic construction of the staff, S, the crosshead cannot only be turned about in any direction, but it and the sighting-knob, s, can be raised by various amounts, being held in place by friction. The hinge at B is made in such a manner that when the staff, S, is placed in a vertical position, the small rod sliding inside can be forced down into a hole in the hinge, the effect of which is to lock the hinge so that the staff is held rigidly in a vertical position.

In using the nephoscope the observer looks down upon the mirror, M, and observes the reflection of the cloud. By moving his eye he brings a point of the cloud image and the reflection of the sighting-knob, s, into coincidence at the centre of the mirror. The head should be held so that the knob is always seen at the centre of the mirror. The cloud image will then appear to move away from the centre of the mirror. The mirror is then revolved until the graduated line becomes parallel with the motion of the cloud, when its direction of motion may be read off and its apparent velocity determined by timing the image as it passes along the graduated scale of the mirror.



The Improved Nephoscope

Other forms of the nephoscope have been devised and used, mostly in European countries, and Prof. Cleveland Abbe, of the United States Weather Bureau, has devised a very convenient form of nephoscope for use on vessels at sea.

In determining the height of clouds, direct observations of their angular altitude are made by two observers at the ends of a measured base-line, whence the altitude may be computed by trigonometric formulæ. The same results may be obtained by photography, but the method is not so direct and the computations are more laborious. Consult Clayden, 'Cloud Studies' (London 1905). The literature of the subject is to be found in the reports of weather bureaus and in meteorological journals.

Alfred J. Henry,
Professor of Meteorology, United States Weather Bureau.

CLOUDS, The, a comedy by Aristophanes; acted in 423 B.C. It is an attack on the new spirit of intellectual inquiry with Socrates as the general type of faulty teacher. The «Sophists» whom Aristophanes attacks are those who delved in science and the professors of letters and rhetoric. Though one of the most interesting and poetic of the author's plays, the people refused to hear it a second time. But its literary popularity counterbalanced its failure on the stage.

CLOUET, kloo-ā, French family of artists, descendants from Flemish ancestry. 1. Jehan, yä'hän, the first known of the family, was in 1475 a resident of Brussels. His works are unknown. 2. His son Jehannet: b. 1485; d. 1541. He migrated to France and located at Tours. In 1518 he went to Paris and became court painter and valet de chambre to Francis I. A portrait of the King, in the Louvre, is said to have been painted by this artist, also another portrait of the King, in the Pitti Gallery, Florence, is credited to him. Several other pictures in European galleries are said to have been painted by him. In all the style is that of the Flemish school. 3. François, son of Jehannet: b. 1510; d. 1572; succeeded his father as court painter to Francis I and retained the position under Henry II, Francis II, Charles IX and Henry III. He executed the wax masks of Francis and Henry II. His portraits are mostly unknown but many have been attributed to him, among them full lengths of Henry II (Uffizi), Charles IX (Vienna), Elizabeth of Austria (Louvre) and a miniature of Catherine de Medici (Vienna Museum). His works are mentioned in the records of the court. Some authorities mention a brother of François, but of him nothing positive is known. Consult De Laborde, Léon, 'La Renaissance des arts à la cour de France' (1855); Grandmaison, 'Les Arts en Touraine' (1870).

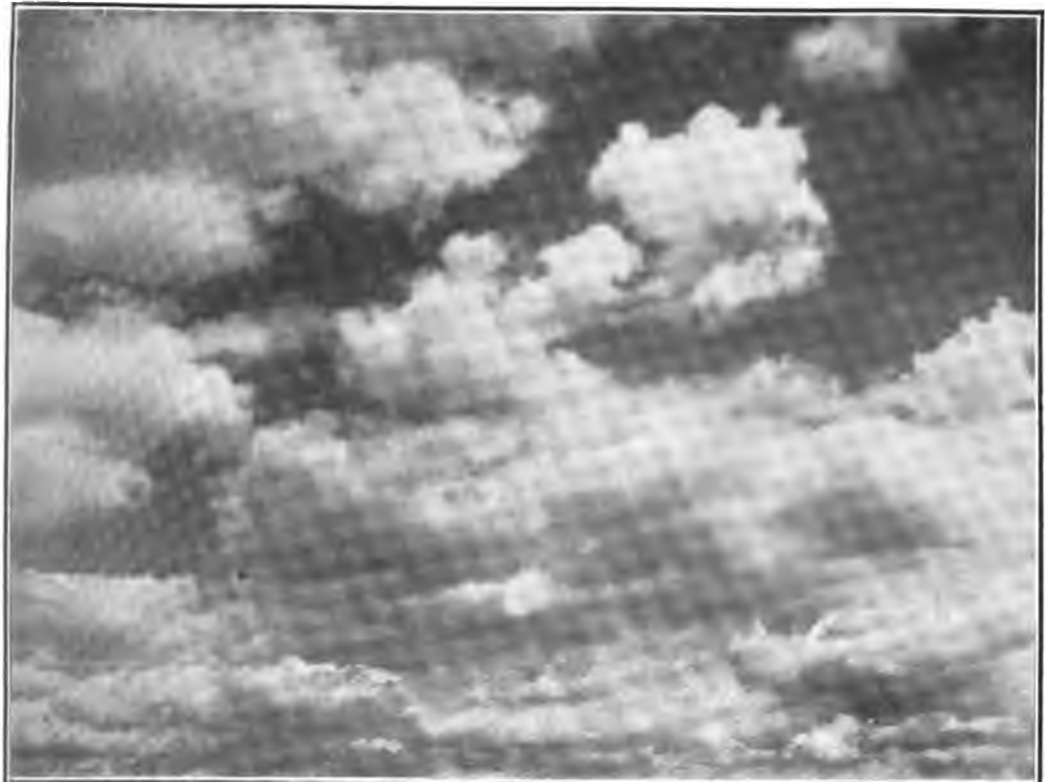
CLOUGH, klō, **Anne Jemima,** English educator: b. Liverpool, England, 20 Jan. 1820; d. Cambridge, 27 Feb. 1892. She was a sister of Arthur Hugh Clough (q.v.), and after a girlhood spent in Charleston, S. C., opened a day school at Liverpool in 1841. Becoming interested in the general subject of education, the North of England Council for Promoting the Higher Education of Women was founded through her efforts, and from this sprang the idea of the Cambridge higher local examinations. Lectures for women having been established at Cambridge in 1869, Miss Clough, in October 1871, took charge of a house of five women students, out of which grew the present Newnham College, over the administration of which she presided until her death. During her busy career she accomplished much for the higher education of English women. Consult Clough, B. A., 'Memoir of Anne J. Clough' (1897).

CLOUGH, Arthur Hugh, English poet: b. Liverpool, 1 Jan. 1819; d. Florence, Italy, 13 Nov. 1861. He studied under Arnold at Rugby, then at Balliol College, Oxford, and became a fellow of Oriel College in 1842. In 1849 he became head of University Hall, London, but resigned in 1852 and went to America, where he lived for a few months at Cambridge, Mass. On his return next year he was appointed an examiner in the education office. His poems were published, along with a genial memoir, by F. T. Palgrave in 1862; his poems and prose remains, with letters and a memoir, were published by his wife in 1869. 'The Bothie of Tober-na-Vuolich' (1848) is his best known poem; others are 'Dipsychus' and 'Amours de Voyage.' They are masculine and vigorous in tone and contain many noble thoughts and strokes of genuine humor, alternating with passages of deep pathos and tenderness. He is affectionately commemorated in Matthew Arnold's 'Thyrsis' and 'Scholar Gipsy.'

CLOUGH-LEIGHTER, Henry, American composer, editor and organist: b. Washington, D. C., 13 May 1874; the agnomen of Clough was given at birth for perpetuation (together with his father's name) as family surname. He was educated privately and at Columbian University (Washington) 1887–89; at the age of 13 he obtained a scholarship at the latter university but relinquished it to give his whole time to the study of music. He became a pupil of Trinity University, Toronto, Canada, in preparation for musical degree; studied harmony, counterpoint and composition under Dr. Edward Kimball, Dr. George Walter, Henry Xander (of Stuttgart Conservatory of Music, Germany) and Dr. J. Humphrey Anger, of Oxford, England. He began piano study at the age of 4, under his mother, a thorough musician and a cultured gentlewoman of high scholarly attainments. From the age of 9 to 12 was solo chorister in Saint John's Church, Washington. At 13 he began the study of the organ under Dr. Walter. At 14 was organist of Saint Michael's and All Angels (Washington); at 15 organist of Church of the Incarnation (Washington); at 18 organist and choirmaster of Epiphany Chapel (Washington); from 1892 to 1899 was organist and choirmaster of Epiphany parish (Washington, D. C.) and also of the Jewish synagogue; from 1899 to 1900 organist and choirmaster of Grace Church, Providence, R. I.; 1900 to 1901 organist and choirmaster of Christ Church and supervisor of the music courses in the schools of Westerly, R. I. During the same year (1900–01) he was instructor of musical theory of the Howe School of Music, Boston; associate editor on editorial staff of Oliver Ditson Company, Boston, 1901–08; became organist of the First Parish Congregational Church, Milton, Mass., in 1901; musical editor of the Boston Music Company since 1908. His published works include five cantatas for voices, with organ or orchestral accompaniment; lyric-suite, 'The Day of Beauty,' for solo voice, piano and string quartet; symphonic ballad, 'Lasca,' for voice and orchestra; victorian ode, 'Recessional,' for large chorus and orchestra; many song-cycles; over 100 art songs, and a like number of choral works. He is also widely known as editor of innumerable musical, technical and pedagogical works.

CLOUS, klous, **John Walter,** American soldier: b. Germany, 9 June 1837; d. New York, 1 Sept. 1908. He came to America in 1855, enlisted in the United States army 2 Feb. 1857, and was promoted second lieutenant 29

CLOUDS



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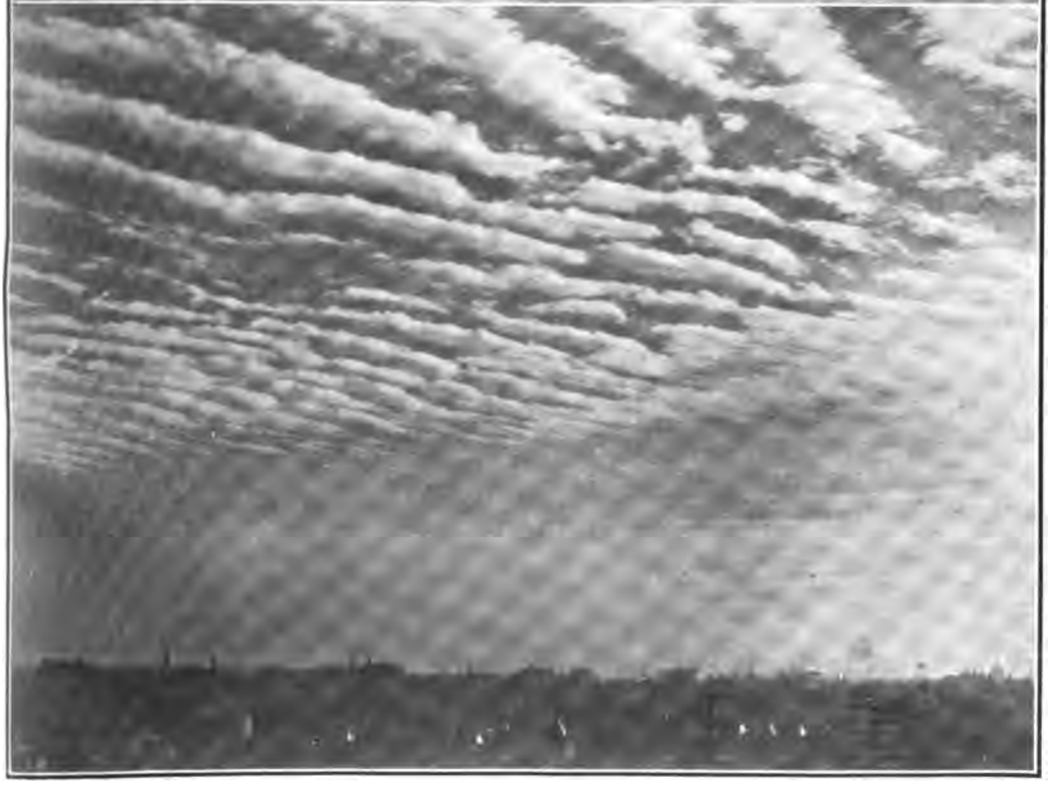

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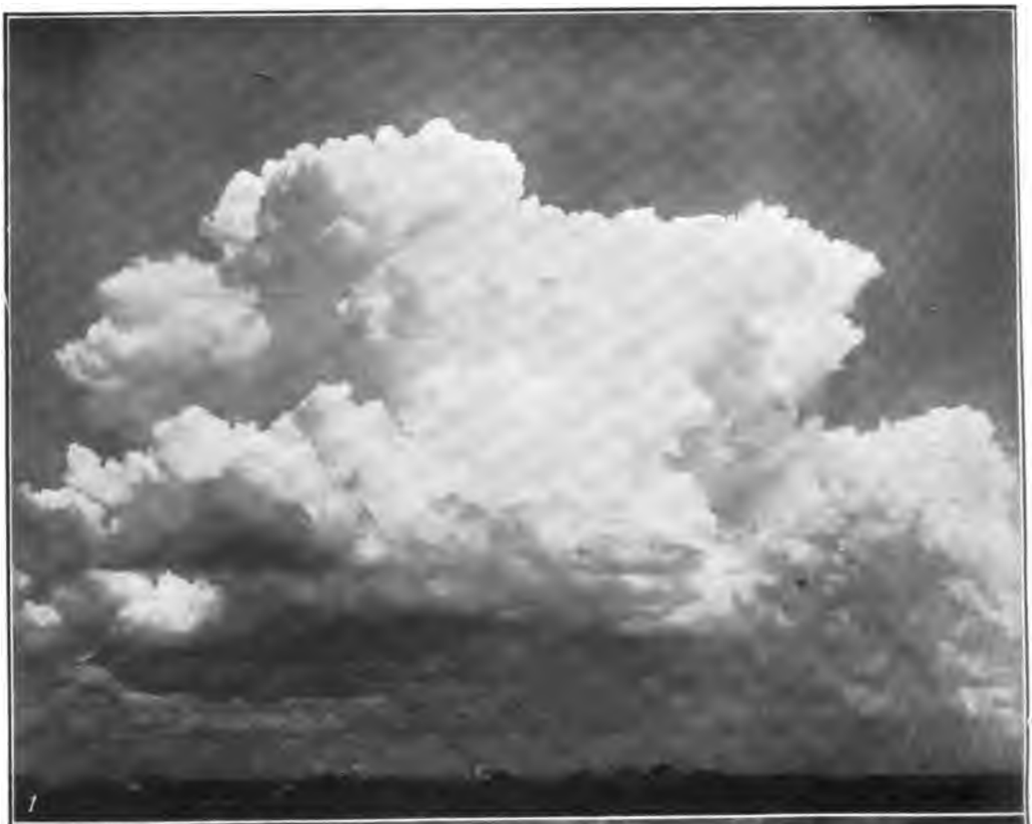
CLOUDS



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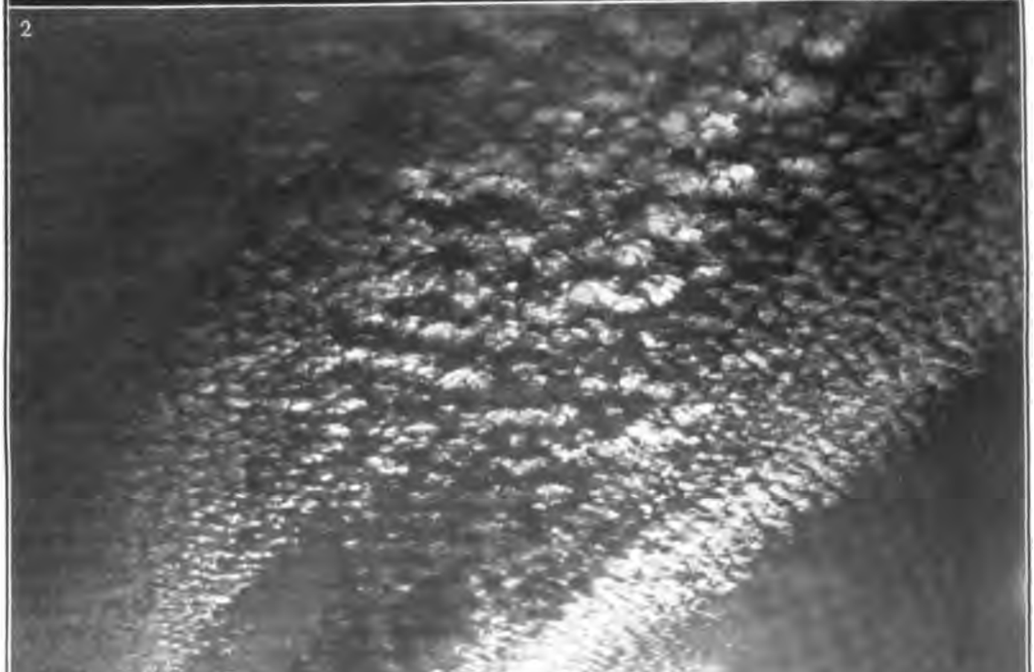

2 Cirrus

Nov. 1862. He took part in the siege of Yorktown, the Seven Days' battles in June 1862, Malvern Hill, Second Bull Run, Antietam, Fredericksburg, Chancellorsville and Gettysburg, being twice brevetted for gallant conduct at the latter. He served on the frontier and in Indian campaigns 1868–86, as judge advocate in many important trials and cases 1862–86, was assistant to the judge advocate-general 1886–90 and professor of law at West Point 1890–96. During the Spanish-American War he was appointed a brigadier-general of volunteers and served on the staff of Major-General Miles. He attained his lieutenant-colonelcy 12 Feb. 1892. He was the author of lectures on 'Military and Martial Law and Suspension of the Writ of Habeas Corpus,' delivered at Union College in the Butterfield lecture course.

CLOUTIER, kloo'tyā', **François Xavier**, Canadian bishop: b. Sainte Geneviève de Batiscan, 2 Nov. 1848. He was educated at Three Rivers and Laval University, and ordained to the priesthood in 1872. He was consecrated bishop of Three Rivers 25 July 1899.

CLOVE, the unexpanded flower-bud of an East Indian tree (*Eugenia aromatica*) somewhat resembling the laurel in its height and in the shape of its leaves. The flowers grow in clusters, and the petals are small, rounded and of a bluish color; the fruit is an oval berry. The Molucca Islands, where the raising of different spices was formerly carried on by the Dutch colonists to a great extent, appear to be the native land of the clove, and the best are still brought from that quarter. At one time, however, in order to secure a lucrative branch of commerce in this article to themselves, the Dutch destroyed all the trees growing in other islands and confined the propagation of them to that of Ternate. But both clove- and nutmeg-trees were transplanted from the Moluccas into the islands of Mauritius and Bourbon, and the clove is now cultivated with success in many warm countries, including Zanzibar and the West Indian islands. At a certain season of the year the clove-tree produces a vast profusion of flowers. The operation of gathering is performed between the months of October and February, partly by hand, partly by hooks and partly by beating the trees with bamboos. The cloves are subsequently dried by exposure to the smoke of wood fires, afterward to the rays of the sun. When first gathered they are of a reddish color, but by drying they assume a deep-brown cast. This spice yields a very fragrant odor and has a bitterish, pungent and warm taste. It is most frequently used in culinary preparations. When fresh gathered, cloves will yield, on pressure, a fragrant, thick and reddish oil; and by distillation a limpid essential oil.

The medical value of cloves is due to the presence of eugenol, $C_{10}H_{12}O_2$, in the volatile oil. Eugenol is extremely active, acting like the phenol, or carbolic acid group, to which it is related. Clove is a marked local anæsthetic, a strong antiseptic and bactericide, an excellent stimulant to the sympathetic nervous system, expelling flatus from the stomach and the intestines, by increased peristalsis, and increasing the flow of the gastric and intestinal juices. Its value in toothache is due to its anæsthetic and bactericidal properties. A number of new compounds of eugenol are on the market. Benzoyl-eugenol and cinnamyl-eugenol are used in the treatment of tuberculosis.

CLOVE-BARK, the bark of various aromatic trees, used in the manufacture of drugs and spices. A tree (*Dicypellium caryophyllatum*) of Brazil supplies a cinnamon-like cylinder which is commonly known as clove-bark in the American markets and is used in medicine as cassia caryophyllata. The name is often given also to culilawan and cinnamon.

CLOVE-PINK, or **CLOVE GILLY FLOWER**, the carnation (*Dianthus caryophyllus*), more especially a whole-colored, clove-scented variety of it.

CLOVER, Richardson, American naval officer: b. Hagerstown, Md., 11 July 1846. He was graduated at the United States Naval Academy in 1867. He was advanced through the various grades, attaining that of rear-admiral in 1907. He had charge of the survey of southeastern Alaska in 1885–86, was hydrographer at the Bureau of Navigation 1889–93 and chief of the Office of Naval Intelligence 1897–98. He commanded the *Bancroft* during the war with Spain and afterward returned to the Naval Intelligence Office. In 1900–03 he was naval attaché at London, and in 1906–08 was president of the Board of Inspection and Survey. He was retired 11 July 1908.

CLOVER, species of the genus *Trifolium*, belonging to the pea family (*Fabaceæ*). Of *Trifolium* about 400 species have been described; they are most abundant in the north temperate zone, a few in South America and South Africa. Some are very important in agriculture, either for pasturage, fodder or for soil-improvement.

The word "clover" is also applied to species of related genera, as bur-clover (*Medicago*), sweet clover (*Melilotus*), bush and Japanese clovers (*Lespedeza*), prairie clover (*Petalostemon*), etc.

The true clovers (*Trifolium*) are herbs with mostly three-foliolate leaves; purple, pink, white or yellow small flowers in dense heads or spikes; and straight membranous pods containing one to four seeds.

The most important species to the farmer is the common red clover (*Trifolium pratense*), now naturalized in North America, but a native of Europe and northern Asia. It has been grown in England for over 300 years. It is a more or less hairy perennial, growing from six inches to two feet high. The flower-heads are dense, oval or ovoid, about one inch long; flowers sessile or nearly so, red, rarely white, remaining erect in fruit; calyx sparingly hairy. It is one of our best forage plants for nutritive value, high yield and good range of adaptability; it is commonly found in meadows and pastures and is used as a green manure. It flowers from April to November. The seed weighs about 60 pounds to the bushel, and, if sown alone, 10 to 12 pounds will sow an acre.

Zigzag clover, cow-grass and marl-grass or mammoth clover (*Trifolium medium*) may be an offshoot of *T. pratense*, from which it differs in being a larger plant, having zigzag stems, the flower-heads larger, longer stalked and often of a deeper purple color, with a practically smooth calyx tube. It is a native of Europe and Siberia and blooms during the summer.

Alsike or Swedish clover (*Trifolium hybridum*) is an erect perennial, growing one to two feet high. Its flowers are pink to white and are open about the same time as those of timothy. It is suited to heavy clay soils and is the only clover that will stand irrigation. It has smaller and shallower roots than common clover. It is sometimes sown alone, when, owing to its small seed, four pounds per acre is sufficient. It is better suited to mixtures. It was introduced into Great Britain from Sweden in 1834.

White, Dutch or honeysuckle clover (*T. repens*) is a common perennial, low-growing plant with white to pinkish flowers, native of Europe, Siberia and perhaps of the northeastern United States. Its method of seeding makes it permanent. As its yield is small it is seldom grown alone, but is often incorporated in mixtures. It is a bee-plant and is common on nearly all soils. See DUTCH CLOVER.

Crimson, carnation, 'Italian or scarlet clover (*T. incarnatum*) is an erect, hairy annual, growing six inches to three feet high. The leaflets are nearly sessile, the flower-heads are terminal, oblong or ovoid, one to two and a half inches long; flowers red, purple, pink or white, sessile; calyx hairy. It is often grown as a catch or cover crop in orchards, etc., and sometimes for grazing and hay. It is quite ornamental and is now grown by the florist.

Yellow clover or hop clover (*T. agrarium*) is a hairless or slightly hairy annual clover, growing 6 to 18 inches high, with small yellow flowers which are open between May and September. It is common along roadsides and waste places. *T. procumbens* is also called yellow clover or hop clover; it is more spreading and hairy than the above. It is common on dry soils. Alexandrian or Egyptian clover (*T. alexandrinum*) is an annual, bearing oval, pale yellow or whitish flowers. As it is an important fodder in Egypt it is presumed that it will be of value for the Southern States. Rabbit-foot, stone or old field clover (*T. arvense*) is a common annual of no value. *T. dubium* is the least hop clover or hop-trefoil, also called yellow suckling clover, and is regarded by some as the true shamrock.

Uses and Feeding Value.— Clovers are grown for hay, pasture, soiling, silage, green-manuring, cover-crops and soil improvement. Clovers or some other legume should have a place in every rotation, because of their deep, fleshy root system and capacity for appropriating free nitrogen from the air in the soil by means of bacteria on their roots. Their deep roots penetrate the sub-soil and transfer valuable plant food to the surface soil, which is liberated when they decay. It has long been known that the growing of legumes improved the soil; Pliny recommended that such crops be grown previous to grain crops. The wisdom of this is now supported by recent research. In 1888 it was announced that the nodules on the roots of leguminous plants were colonies of bacteria, and that their work was to take up nitrogen from the soil-air for the benefit of their host; hence we have the fact that a large quantity of nitrogen may be removed from the soil for a series of years in the form of clover-hay or alfalfa hay — yet the surface soil be richer in nitrogen at the end of the period than it was at the beginning. Plowing a crop of clover under as green-manure is a very effective way of enriching the soil in humus. This is now practised in orchards to a considerable extent; the tillage they receive and the crops removed rapidly deplete the fertility of the land, hence the introduction of the practice of seeding down the orchards during the summer with some legume, as crimson clover, cowpeas, soy-beans, etc., to add humus, protect the land from washing during the fall and winter and in wet seasons, by using up the moisture, to aid in maturing the buds of the trees and enable them to stand the winter; the crop being plowed under the following spring when cultivation begins.

The average percentage composition of clover is given as —

	Protein	Nitrogen-free extract	Ether extract	Crude fibre	Ash	Water
Red clover, green.....	4.4	13.5	1.1	8.1	2.1	70.8
Alsike clover..........	3.9	11.0	0.9	7.4	2.0	74.8
Red clover, silage.....	4.2	11.6	1.2	8.4	2.6	72.0
Red clover hay.......	12.3	38.1	3.3	24.8	6.2	15.3
Alsike clover hay.....	12.8	40.7	2.9	25.6	8.3	9.7

With ruminants the average coefficient of digestibility is —

	Dry matter	Protein	Nitrogen-free extract	Crude extract	Crude fibre
Red clover, green..........	66	67	78	65	53
Red clover hay............	61	62	69	62	49

At the Wisconsin station, clover cut three times in one year yielded 25 tons of green forage per acre; this may be regarded as a maximum yield. The first cutting, made 29 May, contained only 8.2 per cent of dry matter and was on this account unsatisfactory as a soiling crop, although, generally speaking, this crop is a most valuable one for this purpose, being relished by all stock. The total dry matter contained in the three crops was nearly four tons per acre.

If given in excess while green, or grazed, it is liable to cause bloat. To prevent this, give dry fodder in addition, and do not turn the animals out when they are very hungry or the dew is on. Clover pasture is excellent for growing pigs, and they may be fattened on it.

Experience has shown that the best time to cut clover for hay is when one-third of the heads are turning brown. As ordinarily cured it is liable to be dusty, hence it is not considered a satisfactory feed for horses. For growing and idle horses, bright, clean clover hay is both economical and valuable. Hay from overripe crimson clover is dangerous for horses; the bristly hairs, accumulating in the intestines, form balls, causing stoppages and death. Clover hay is a most valuable forage for cattle, especially milch cows; 10 to 12 pounds may be fed daily, its high nitrogen content permitting a reduction of the amount of concentrated feed.

It is one of the best coarse fodders for sheep, and when chaffed fine is used for feeding laying hens in winter.

Clover Diseases.— The common diseases are: Clover rust (*Uromyces trifolii*), which appears in various stages on the leaves, leaf-stalks and stems of the plant, particularly of white clover. White minute cups appear in spring or early summer, accompanied or followed by small brown spores, which are finally followed by darker spores which live through the winter and germinate the following spring.

Clover rot (*Sclerotinia trifoliorum*) attacks many legumes. The disease causes a browning of the stem and leaves, which are soon spotted with a white mold, which ultimately forms solid, wavy, black bodies often half an inch long. These produce mushroom-like bodies the following spring. Burning over the infested field and a proper rotation of crops are advocated for both diseases.

A leaf-spot (*Pseudopeziza trifolii*) is often destructive, especially during a wet fall. The leaves are covered with small black spots. Dodder (q.v.) is a parasitic plant responsible for considerable loss in some places.

Clover Insects.— Of the various insects which injure clover the following are prominent: The clover-root borer (*Hylastes trifolii*), which has in some sections killed out the clover the second year, thus necessitating a change in the rotation of the crops. The clover-stem borer (*Languria mozardi*) is widely distributed. The clover-leaf beetle (*Phytonomus punctatus*) is a weevil which feeds at night, consuming all parts of the plant. The clover-leaf midge (*Cecidomyia leguminicola*) is one of the worst pests; the eggs are laid in the blossoms, where the larvæ feed on what should be the seed. They pupate in the ground or in the seed. There are two or three broods annually. Various insects attack the stored hay, the most common being the clover-hay worm (*Asopia costalis*).

CLOVER-WEEVIL. See WEEVIL; CLOVER INSECTS.

CLOVES, Oil of. See CLOVE.

CLOVIS, king of the Franks: b. about 465; d. Paris, 27 Nov. 511. He succeeded his father, Childeric, in the year 481, as chief of the warlike tribe of Salian Franks. He united with Ragnacaire, king of Cambray, declared war upon Syagrius, the Roman governor at Soissons, and utterly routed the Romans near Soissons, in 486. Soissons was then made the capital of the new kingdom of the Salian Franks. Clovis married Clotilda of Burgundy (q.v.), who had been educated in the Christian faith and was desirous that her husband also should become a Christian. When he was hard pressed in a battle against the Alemanni at Tolbiac in 496, Clovis called on the God of Clotilda and the Christians. Consequently, when the victory was won, and territory of the Alemanni submitted to him, he was solemnly baptized at Rheims, 25 Dec. 496, with several thousand Franks, men and women. Hostilities soon broke out between Alaric, king of the Visigoths, and Clovis. In the battle fought at Vouglé, near Poitiers, the latter gained a complete victory, slaying his enemy with his own hand. After this victory Clovis received the honor of the consulship from the Emperor Anastasius. In the last year of his reign Clovis had called a council at Orleans, from which are dated the peculiar privileges claimed by the kings of France in opposition to the Pope. His plans for a unified Frankish kingdom, for which he labored unscrupulously all his life, were frustrated in his own last testament, which divided the newly organized realm among his four sons. Consult Gregory of Tours, 'Historia Francorum' (Bk. II, ed. by Arndt for the 'Monumenta Germaniæ Historica,' Hanover 1885); Junghaus, 'Geschichte der fränkischen Könige Childerich und Chlodwig' (Göttingen 1857); Schultze, 'Deutsche Geschichte von der Urzeit bis zu den Karolingern' (Vol. II, Stuttgart 1896); Kurth, 'Clovis' (2d ed., Paris 1901).

CLOVIS II, king of Neustria and Burgundy; d. 655. He was the second son of Dagobert, whom he succeeded in 638.

CLOVIS III, king of France: d. 695. He was the son of Thierry III, whom he succeeded in 691 at the age of nine. He reigned five years, under the guardianship of Pepin d'Heristal, mayor of the palace.

CLOWES, klowz, **Frank**, English chemist: b. Bradford, Yorkshire, 1848. He was educated at the Royal School of Mines, London, Royal College of Science, Dublin, and the University of Würzburg, and was professor of chemistry at University College, Nottingham, 1881–97, and first principal. He has published 'Text-book of Practical Chemistry and Qualitative Analysis'; 'Text-book of Quantitative Analysis'; 'Elementary Practical Chemistry'; 'Introductive Quantitative Analysis' (1890), etc.

CLOWES, SIR **William Laird**, English naval critic: b. London, 1 Feb. 1856; d. there, 14 Aug. 1905. He was educated at King's College, London; and from 1876 to 1895 was correspondent for various newspapers. He wrote much on naval development and on art and sociology. His works include 'The Needs of the Navy'; 'Four Naval Campaigns' (1902); 'Told to the Marines' (1902); 'Black America' (1892); 'Eclogues' (1889). He was the editor and chief contributor to 'The Royal Navy; a History' (1897–1903). He was knighted in 1902.

CLOWN, a rôle peculiar to the stage of English-speaking people, but bearing some resemblance to the *gracioso* of the Spaniards, and the *Hanswurst* of the Germans. The origin of the word is uncertain, some deriving it from the Latin *colonus*, in the sense of a peasant farmer, and others connecting it with certain Scandinavian and other Teutonic words. On the old English stage the clown was the privileged laughter-provoker, who, without taking any part in the dramatic development of the piece represented, carried on his improvised jokes and tricks with the actors, often indeed addressing himself directly to the audience instead of confining himself to what was going on on the stage. In Shakespeare, on the contrary, a distinct part was assigned to the clown, who no longer appears as an extempore jester, although the part he plays is to a certain extent in keeping with his traditional functions. At a later period the clown was altogether banished from tragedy and allowed to appear only in the after-piece, performing grotesque dances, singing comic songs, etc. He is now confined to the pantomime, where his part is generally of a more burlesque character than that of the French Pierrot; and in circuses where his performances are of the tumbling and clumsily acrobatic nature.

CLOYD'S MOUNTAIN, Battle of. On 3 May 1864 Gen. George Crook of the Union army marched from Fayette, W. Va., to break the Virginia and T. Railroad at the New River bridge. He had 11 regiments of infantry and two batteries of artillery, in all about 6,100 men, brigaded under Col. H. G. Sickel, C. B. White and R. B. Hayes. He marched through Raleigh, drove a small Confederate cavalry force from Princeton and on the 8th reached Shannon's Bridge, seven miles from Dublin, where he was joined by 400 cavalry. Here he found next morning that the Confederates — three regiments and a battalion of infantry and two batteries — under Gen. A. G. Jenkins and Col. John McCausland, were barring his way, strongly posted behind log and rail breastworks, on a steep and thickly wooded spur of Cloyd's Mountain, with guns sweeping the road and open country in front. Crook opened on the position with artillery, and then, under cover of the timber, sent White with his own brigade and two regiments of Sickel's to turn the enemy's right, and the moment they were engaged Sickel and Hayes charged directly to the front across a meadow swept by artillery and musketry fire and up the steep ridge. Parts of the line were repulsed, again to rally and go forward, and after a hard contest, in which bayonets and clubbed muskets were used across the works, they were carried, the Confederates retreating to Dublin, leaving, as Crook reports, 230 unwounded men as prisoners, and two guns, in his hands. The Union loss was over 600, that of the Confederates about 500. General Jenkins was mortally wounded and left on the field. Crook followed the retreating troops, and when near Dublin encountered about 500 of Gen. John H. Morgan's command, under Colonel Smith, that had come from Sattville and endeavored to cover McCausland's retreat. These Crook drove back and at night he occupied Dublin. On the 10th he marched to Newborn and thence to New River Bridge, which McCausland tried to save, but after a two-hours' artillery duel in which Crook had 11 men killed and wounded, he seized and destroyed the bridge and the railroad for a considerable distance, then marched by way of Union, Alderson's Ferry and Lewisburg to Meadow Bluff, which he reached on the 19th, his march harassed by the enemy's cavalry. Crook's entire loss was 109 killed, 513 wounded and 72 missing. On his return march he was obliged to leave 200 of his wounded, with surgeons, who were captured. The Confederate loss, as reported, was 76 killed, 262 wounded and 200 missing or captured. Consult 'Official Records' (Vol. XXXVII); Pond, 'The Shenandoah Valley in 1864.'

E. A. Carman.

CLOYNE, Ireland, town 16 miles southeast of Cork. It has an ancient cathedral, near which is a round tower, a free school, founded by Bishop Crow in 1726, and is the seat of a Roman Catholic bishopric. It has boot and shoe manufactures. From 1638 to 1833 it was the see of a bishop belonging to the Established Church of Ireland, but in the latter year it was united with Cork and Ross. From 1734 to 1753 George Berkeley, the philosopher, was bishop of Cloyne. Pop. of parish 2,203.

CLUB (A. S. *cleofan*, to divide, the club expenses being shared by the members), a company of persons associated for some common object — social, literary, political, etc. It has been claimed that social clubs were known to the ancient Romans, but the evidence of their existence is scanty. Inscriptions tell of clubs of Roman citizens in foreign cities and also of military clubs. For several centuries the club has been a peculiar institution in England and of late it has become a prominent feature in American life. It is not easy to determine at what time clubs originated in England, but Occleve mentions one to which he belonged (during the reign of Henry IV), called «La Court de Bonc Compaignie.» In 1659 Aubrey explained the word «clubbe» as meaning «a sodality in a taverne.» He adds, «Here we had a balloting-box and balloted how things should be carried.» The earliest London club of any celebrity was established about the beginning of the 17th century, at the Mermaid Tavern, Friday street (otherwise known as Bread street). Among its members were Shakespeare, Sir Walter Raleigh (the founder), Beaumont, Fletcher, Donne and Selden. Ben Jonson figured at another club, which met at the Devil Tavern, near Temple Bar. It appears certain that clubs existed alongside of coffee-houses in the 17th and 18th centuries. At that time, however, their character was very different from what it is now. The coffee-houses of those days were the nearest representatives of the modern clubs, while the clubs were commonly nothing but a kind of restaurants or taverns where people resorted to take their meals. There was one feature, however, which was peculiar to clubs from the first, and distinguished them from coffee-houses; namely, that, while anybody was free to enter a coffee-house, it was absolutely necessary that a person should have been formally received as a member of a club, according to its regulations, before he was at liberty to enter it. Almack's, Brooks' and White's were among the best known coffee-houses. Among the earliest of the London clubs was the Kit-Cat Club, formed in the reign of Queen Anne. Among its 40 members, who used to meet at the shop of a pastry-cook (Christopher Cat or Katt), in order to do justice to certain mutton pies for which he was famous, were six dukes, among them the Duke of Marlborough; five earls; many of the most distinguished leaders of the Whig party, such as Sunderland, Halifax, Sir Robert Walpole and others; and several of the leading authors of the day, among them, Vanbrugh, Congreve, Addison and Steele. The last two owed to the club idea the form given to the *Spectator*. Another club formed about the same time was the Beefsteak Club. Originally these two clubs had no pronounced political views, but in the end they began to occupy themselves with politics, the Kit-Cat Club being Whig and the Beefsteak Club, Tory. There have been several Beefsteak clubs since. During the last century it was common to give eccentric names to clubs and the conditions of being admitted to membership in any one of these clubs were as a rule equally remarkable. Among these may be mentioned the Surly Club; the Split-farthing Club; the Ugly Club (of which Wilkes was elected president for life, and Mirabeau was an honorary member); the Unfortunate Club; the Lying Club, the members of which were not permitted to utter a single truth during their sittings, unless they had been expressly authorized to do so by the president. Perhaps the most celebrated club of the 18th century was that which was first called 'The Club,' but which was afterward known as the Literary Club. It was founded in 1764 and numbered among its members Dr. Johnson, who was for a long time its president, Sir Joshua Reynolds, Edmund Burke, Oliver Goldsmith, Edward Gibbon and other distinguished men. In 1864 the 100th anniversary of its foundation was celebrated. In the rules which Dr. Johnson wrote for another club, the Apollo, he coined the still-serviceable word, «clubbable.» In 1800 there were only half a dozen clubs existing in London and within a century there were 100, with a total membership of 80,000. The most important London political clubs of the present day are the Carlton Club, founded by the Duke of Wellington, and the Reform Club. The former is the principal club belonging to the Conservative party in the kingdom and the building in which its members meet, which is the most palatial edifice of the kind in the kingdom, may be regarded as the headquarters of the Conservative party. This club was founded in 1832 (2,000 members). The Reform Club, the building belonging to which stands next to that of the Carlton Club, was long the great club of the Liberal party, founded in 1837. Among the other important London clubs are the National Liberal, Constitutional, United Service, Athenæum, Army and Navy, Travelers, Garrick, Primrose, etc. Similar clubs were started in the chief cities of England and in the colonies.

The first French society to take the name club was Le Club Politique, established in 1782, and a few years later, Le Club de Boston or Club des Américains, was formed in Paris. The political clubs had no regular form, as they were tolerated only during revolutionary epochs. The Club des Jacobins, the Club des Feuillants, the Club des Cordeliers and the Club de Montrouge were the most famous clubs of the time of the first French Revolution and formed the storm-centres of that movement. None of the French clubs survived the *coup d'état* of 9 Nov. 1799, by which Napoleon overthrew the Directory. Two clubs were formed during the revolution of 1830, but they were both dissolved by the law relating to associations. At the revolution of February 1848 hosts of clubs started into existence, the most celebrated of which was the Central Republican Society (*Société centrale républicaine*), but their duration was short, for the Constituent Assembly in the following year ordered them all to be closed.

About the same periods as in France, political clubs were introduced into Italy, Germany and Spain, especially during the time of the first French Revolution and that of 1848. In Germany, however, they were put down by a law of the empire in 1793 and in 1832 a federal decree was issued prohibiting all kinds of political societies and assemblies. In 1848 the number of clubs found in Italy, and particularly in Germany, was very great, but their collapse was as sudden as their rise. Later in the century municipal clubs, somewhat on the «good government» order, arose in Prussia. The city of Berlin had 75 such organizations in 1896. Some of these clubs maintain death-benefit and savings-bank features. Social clubs of the English type have not spread rapidly on the Continent. In France the name *cercle* was given to clubs of this nature. The most fashionable clubs of Paris are Le Cercle de la rue Royale and the Jockey Club. Many sports besides horse-racing are represented in the club life of the French capital. The automobilists and the devotees of yachting, fencing, etc., have their separate organizations. There are also cercles for army officers, for literary men, for artists and one connected with agricultural interests. Alpine clubs (q.v.) are found in many European countries. The French society of that name has numerous branches. Catholic clubs of workingmen exist in different parts of the country.

Although clubs were not unknown in the United States toward the close of the 18th century (the Hoboken Turtle Club dating back to that period), yet their spread and development were slow previous to the Civil War. Among those antedating the War were the Union Club of New York (1836), the Somerset Club of Boston (1857) and the Maryland Club of Baltimore (1857). The Union League Club of New York (1863) grew out of the purpose to defend and perpetuate the national integrity, to encourage loyalty to the Federal government. Other Union League clubs were formed later in Philadelphia and other cities; and in all the important centres of the country there grew up large and flourishing societies of a political or social nature, or such as combined the two features. The Manhattan Club became the chief social Democratic club of New York. The Saint Nicholas Club represented a different type, a society founded upon a similarity of ancestry or antecedents and endeavoring to preserve historical associations. As these organizations have increased in number they have become more varied in character, until not only politics, science, art, music, literature, sociology, religion, philanthropy and professional, commercial, social and sporting life are all represented, but the subdivisions are bewildering and continually increasing. Athletic clubs of various kinds are numerous and popular, abroad as well as in America.

University clubs draw together the college-bred men of various sections or cities. The largest one of the kind in the United States is that in New York, which has over 3,500 members. The city has also a Yale, a Harvard, a Princeton and several other college clubs. Among the largest clubs of the metropolis, in addition to those already mentioned are the following: New York Athletic, New York Yacht, Century, Army and Navy, Metropolitan, Players, Lotus, The Knickerbocker Club, Authors' Club, Press Club, Grolier Club, Catholic Club, Holland Society, etc. The Chicago Athletic Club has 3,000. In Philadelphia, in addition to the Union League, the Manufacturers' Club, the Art Club, the Rittenhouse, and the New Century, are numerically strong. Clubs devoted to the cultivation of vocal music, many formed of the German element in our cities, are prominent. Among these societies are the Liederkranz, the Arion and the Mendelssohn.

Wherever the Anglo-Saxon race is represented in sufficient numbers, even in the remotest parts of the globe, the club idea has taken root, and we find English-speaking clubs or such as are suggested by or modeled upon English originals. India has more than 300 clubs; Peking has its Reform Club; Cairo its Cycling Club, and Zanzibar its Golf Club. The Scotch Thistle Club of Hawaii shows its origin in its name and springs from the same source as the Caledonian clubs of America. Indeed, the tendency of men of a common blood to seek, when on a foreign soil, a social bond of unity, accounts for a special type of club. The line between organizations calling themselves societies and those known as clubs is not always distinctly marked, but in general it may be said that where the social element is slight or lacking, the term club is inappropriate. This element entered largely into organization of many women's clubs in the early history of such societies, but their literary, professional and especially their philanthropic features have become more prominent of late years. See Boys' Clubs; Girls' Clubs; Mothers' Clubs; Women's Clubs; Workingmen's Clubs.

CLUB-FINGERS. See Hand.

CLUB-FOOT (Lat. *Talipes*), a congenital or acquired distortion of the foot, of which there are several varities. Sometimes the foot is twisted inward (*T. varus*); sometimes the heel is raised and the toes only touch the ground (*T. equinus*); sometimes the foot is twisted outward (*T. valgus*); or it rests only on the heel (*T. calcaneus*). The deformity consists at first in the contraction of the muscles and tendons of the feet, but ultimately the bones become distorted. If attended to in time, the foot may be gradually coaxed to its natural shape, and even in more advanced cases the deformity is usually curable by modern surgery. The deformity is usually acquired in anterior poliomyelitis, the changes involving the tendons, muscles, bone and ligaments. The treatment is manual, mechanical or surgical. Stromeyer performed the first operation for clubfoot in 1731. Consult Gould and Pyle, 'Cyclopedia of Medicine and Surgery' (Philadelphia 1912).

CLUB-MOSS, the common name of the *Lycopodiaceæ*, a family of cryptogamic plants allied to the ferns, containing four genera and 150 species. Two of the genera, *Lycopodium* and *Psilotum*, are found in America, and two in Australia only. The club-mosses are found as gigantic fossils in the Upper Silurian, Devonian and Carboniferous periods, and are a marked feature of the rocks of the two latter periods. See Lycopodium.

CLUBROOT, ANBURY, or **FINGER-AND-TOE** (*Plasmodiophora brassicæ*). This fungous disease is known under the above common names; it attacks turnips, cabbages, cauliflowers and allied plants, often seriously injuring the crop. The term «club-root» arose from the club or wart-like excrescences which result from a plant being infested; owing to the tendency of the root to split up in this manner the term «finger-and-toe» is also applied. In Europe these knob-like growths cannot be regarded as conclusive evidence of this disease, as they may be due to attacks of a gall insect. This fungus belongs to a very low order known as the slime-fungi; it can readily enter the young host plant, where it grows and reproduces rapidly; by the time the host should be mature, in fall, the fungus has formed millions of spores, which live over winter. The fungus can live for years in the soil, and no means of killing it is known, although applications of lime and potash reduce its ravages considerably. Methods of prevention are advocated, as, keeping the land free from cruciferous weeds, as wild mustard, etc., and destruction of all affected roots by burying with quicklime, or burning; and rotation of crops. Special attention should be paid to the seedbed which is often the source of the spreading of the disease.

CLUGNET, cloo'nyā, **Joseph Léon Tiburce,** French Orientalist: b. Lyons, France, 8 May 1848. He was educated at the University of Lyons, the University of France, the Episcopal College, Ware, England, and the Episcopal College of Gibraltar. He was appointed professor of rhetoric at the Collège de Pontoise and fought in the Franco-Prussian War. From 1875 to 1880 he was librarian of the University of Lyons and since 1880 has devoted himself to research work in Oriental languages, hagiography and folklore. From 1898 to 1908 he was director of the *Revue de l'Orient chrétien*. In 1912 the Minister of War bestowed on him the Military Medal of the Volunteers of 1870–71. He has published 'Géographie de la soie' (1877); 'Carte des régions séricoles' (1877); 'Nouveau guide du touriste au Mont-Dore' (1877); 'Sculptures préhistoriques situées dans les environs des lacs des Merveilles' (1877); 'Glossaire du patois Gilhoc' (1883); 'Dictionnaire grec-français des noms liturgiques en usage dans l'Eglise grecque' (1895); 'Les offices et les dignités ecclésiastiques dans l'Eglise grecque' (1899); 'Bibliographie du culte local de la Vierge Marie' (3 vols., 1899——); 'Vie et récits de l'abbé Daniel le Scétiote,' (Greek text, 1901); 'L'Empire ottoman,' (translation of Kellner's German text, 1877); 'Calendrier de l'Eglise copte d'Alexandrie,' (from Nilles' Latin, 1898); 'Ascensions du pic de l'Etendard, du Grand Sauvage, et du Mont Blanc' (1879). He was also one of the editors of 'Bibliothèque hagiographique orientale' (1901——) and is editor of *Polybiblion*.

CLUMBER SPANIEL. See Spaniel; Dog, Sporting Spaniel.

CLUNIACS, or **CONGREGATION OF CLUNY,** klü-nē, a monastery of that branch of the Benedictine order known as the Congregation of Cluny, or as Cluniacs. It was founded in 912, at Cluny, or Clugny, 15 miles from Macon on the Saône. In the 12th and 13th centuries Cluny was perhaps the most notable monastic foundation in Europe: it had many hundred monasteries under the jurisdiction of its abbot. The first Cluniac house in England was founded by the Earl of Warenne, companion-in-arms of William the Conqueror. The church of the mother, established at Cluny, built in the 11th century, was regarded as one of the wonders of the world: this monument of Gothic architecture was at the Revolution secularized by the republican government and was sold to the commune of Cluny, and by them was leveled with the ground. Napoleon, on being invited by the townsmen to visit the place, made reply, «No; you are vandals.» There were suppressed by Henry VIII in England and Wales 35 Cluniac houses, one of them a convent of nuns.

CLUNY, or CLUGNY, a town in the department of Saône-et-Loire, France, 12 miles northwest of Macon. It has an industrial college and manufactures pottery, paper, leather and yarn. It has several splendid pieces of architecture, the Benedictine abbey of the 9th century, the church of Notre Dame dating from the 13th century; the church of Saint Marcel with a 12th century steeple; the ruins of Saint Mayeul, the abbot's palace; portions of fortifications; picturesque houses and other historical monuments. The abbey church, before the erection of Saint Peter's at Rome, was the largest of its kind in Europe. It was destroyed in 1790. A model is preserved in the town museum. Cluny is the birthplace of the artist Prud'hon. Consult Bernard, ‘Les chartes de l'abbaye de Cluny’ (Paris 1876–94); Duckett, ‘The Archives of the Ancient Abbey of Cluny’ (1886); Penjon, ‘Cluny, la ville et l'abbaye’ (Cluny 1872).

CLUNY, klu'né, **Hôtel de,** a Gothic edifice in Paris, built by the Benedictines of Cluny in the 15th century. It is located on the site of a Roman palace. In 1515 it became the residence of Mary, widow of Louis XII, and James V of Scotland was married there in 1537. It passed over to the state during the Revolution, and in 1833 was purchased by the antiquarian Du Sommerard. In 1842 it was purchased, together with its museum collections, by the state.

CLUPEIDÆ, a family of soft-rayed fishes, containing the shads, herrings, anchovies, pilchards, sardines, etc., elsewhere described. They are mostly marine, but none live in deep water. The best known species go in schools and are anadromons; and those of northern seas include several of the most abundant and valuable of marine food-fishes. About 200 living species are named, and fossil members of the family are numerous, especially in Cretaceous and early Tertiary strata.

CLURICAUNE, kloo'rē-kôn, in Irish mythology, an elf of evil disposition who usually appears as a wrinkled old man and has knowledge of hidden treasures.

CLUSERET, kloo-zė-ră', **Gustave Paul,** French officer and Communist: b. Paris, 13 June 1823; d. Toulon, 23 Aug. 1900. He was educated at Saint-Cyr, distinguished himself during the insurrection in Paris, fought in the Crimean War and in Africa against the Kabyles and became a captain in 1855. In 1858 he resigned his commission and in 1860, as commander of the French volunteers, joined Garibaldi in the expedition to Sicily and Naples. He came to the United States soon after the breaking out of the Civil War, and after serving on General McClellan's staff became a brigadier-general. In 1864 he edited the *New Nation,* in New York. Subsequently he returned to Paris, and was War Minister of the commune in April 1871. By his endeavors to improve the military organization of the Communist troops he gave offense to the central committee, but was accused of treachery and imprisoned at Mazas. From Paris he fled to England and Mexico, and was condemned to death by a military tribunal in 1872. He was, however, pardoned and allowed to return to Paris in 1880, and in 1888, 1889 and 1893 was elected to the Chamber of Deputies. He published ‘Memories du général Cluseret’ (1887–88).

CLUSTERED COLUMN, or CLUSTERED PIER, in architecture, a pier which appears to consist of several columns or shafts clustered together; they are sometimes attached to each other throughout their whole height and sometimes only at the capital and base. This form was characteristic of the Middle Ages, though not absolutely unknown to the ancient East, since one has been found at Tello. It is supposed to have originated from an attempt to vary the square pier then in use. From this Romanesque pier, which had a square core on each face of which a semi-column or shaft was attached, developed the Gothic clustered pier based on a circular core and more slender and varied. A fine example is in the Amiens Cathedral. There are many varieties of this form of pier, depending on the size, grouping, number, the connection with vaulting ribs, etc. The clustered column vanished in the Renaissance, except in its simplest forms.

CLUTCH, a mechanical device by which rotary motion of a shaft is transmitted to another gradually without shock by means of connecting elements normally independent. The connection is established in several ways, as by teeth, by cams, by friction of two surfaces or by electro-magnets. Friction clutches of various types are in common use, and of these the disc type is perhaps that most frequently met with. Clutches have found extensive application in motor vehicles. Consult Holman, ‘Motor Vehicles’ (New York 1917); Souther, ‘Transactions of the American Society of Mechanical Engineers for 1908.’

CLUTE, Willard Nelson, American botanist: b. Painted Post, N. Y., 26 Feb. 1869. He was educated in the public schools and in 1897 became assistant curator of the botanical department of Columbia University. In 1898–99 he was curator of the New York botanical garden. From 1903 to 1910 he was instructor in biology at the Joliet High School, and in 1910–11 at the Curtis High School, Chicago. Since 1911 he has been head of the biology department of the Flower Technical High School for Girls, Chicago. He was formerly publisher of the *Plant World;* also editor and publisher of the *Fern Bulletin* and the *American Botanist.* He has published ‘A Flora of the Upper Susquehanna Valley’ (1898); ‘Our Ferns in their Haunts’ (1901); ‘The Fern Collector's Guide (1902); ‘The Fern Allies of North America’ (1905); ‘Laboratory Botany for the High School’ (1909); ‘Agronomy for High Schools’ (1912); ‘Laboratory Manual and Notebook in Botany’ (1913).

CLUTHA, kloo'thạ, sometimes called MOLYNEUX, the largest river of New Zealand, in the southern part of the South Island. It receives the waters of lakes Hawea, Wanaka and Wakatipu and flows in a southeasterly direction, traverses the province of Otago and empties into the sea in Molyneux Bay, after a course of 150 miles.

CLUTTERBUCK, Captain Cuthbert, the feigned editor of three of Scott's novels, 'The Monastery,' 'The Abbot' and 'The Fortunes of Nigel.'

CLUVER, kloo'vėr, or **CLUVERIUS, Philipp,** German geographer and antiquarian: b. Danzig 1580; d. Leyden 1623. He applied himself first to the study of law, but afterward, against the will of his father, almost exclusively to history and geography. Being on that account left without support by his father, he was compelled to enter the service of the Austrian army, but at the end of two years he returned to his favorite pursuits. He now traveled through England, Scotland, France, Germany and Italy and then settled in Leyden, where he was made "Geographus Academicus." In 1617–18 he undertook a second journey through Italy and Sicily on foot. His first geographical work, 'Germania Antiqua,' was published in 1616. Two carefully prepared antiquarian works, one on Sicily, Sardinia and Corsica, the other on Italy, followed. His most important work was not published till after his death. It is entitled 'Introductio in universam Geographiam tam Veterem quam Novam,' and is the first successful attempt at a systematic treatment of geography in the whole extent of its historical and political relations. The first edition appeared at Leyden in 1629, but it has been frequently republished. The most complete edition is that of Bruzen de la Martinière (1729). His other works are 'Italia Antiqua' (1624) and 'De Tribus Rhein Alveis atque Ostiis' (1611).

CLUYSENAAR, the name of a Dutch and Belgian family of architects, the most famous of whom was Jean-Pierre: b. Kampen, 23 March 1811; d. Brussels, 16 Feb. 1880. He studied at the Academy of Fine Arts at Brussels and under Suys. His works are numerous. Among them are the Palace of Arenburg and the palaces of the Academies (with Suys); the galleries of Saint Hubert at Brussels, where are also the hospital for the blind, hotels, the opera-house and the Royal Conservatory of Music. There are numerous churches, hotels and other buildings of his work to be found throughout Belgium. His son, Alfred, b. Brussels, 24 Sept. 1837; d. there, 23 Aug. 1902, at first studied sculpture with his father, but was more attracted to painting and subsequently studied art in Brussels and Paris, exhibiting 'A Dominican Meditating' in 1861. Other pictures of his are a 'Vocation,' now in the Brussels Museum, and a 'Mazeppa,' and six large mural paintings for the University of Ghent. Consult Lucas, C., 'Essai d'un Catalogue alphabetique des architectures belges et hollandais' (in the *Revue generale d'architectures,* Paris).

CLWYD, kloo'ĭd, Wales, a river in County Denbigh, rising on the northeast of the Bronbanog, and entering Abergele Bay, after a course chiefly northwest of about 30 miles, during which it is joined by several small tributaries.

CLYDE, Lord. See Campbell, Sir Colin.

CLYDE, N. Y., village of Wayne County, 35 miles west of Syracuse, on the New York Central and West Shore railroads, and on the State Barge Canal. Its industrial establishments include a boiler and steam-engine factory, a canning factory, harness works and glassworks. Pop. 2,695.

CLYDE, Ohio, village in Sandusky County, 75 miles southwest of Cleveland, on Cleveland, Cincinnati, Chicago and Saint Louis, the Lake Shore and Michigan Southern, the Wheeling and Lake Erie and the Lake Shore Electric railroads. The village is the birthplace of Gen. James B. McPherson, and a fine monument has been erected to his memory. It has a Carnegie library and manufactures cutlery, barrels, screens, automobiles, etc. The village owns the waterworks and electric-lighting plants. Pop. 2,815.

CLYDE, klīd, Scotland, a river which rises as Daer Water in the Lowther Hills in the southern extremity of Lanarkshire. Its watershed is approximately concident with the boundaries of that county. In its upper reaches it is a mountain stream flowing through bleak uplands. Near Lanark are the celebrated falls, named respectively Bonnington Linn, Corra Linn, Dundaff and Stonebyres Linn, the finest of the series being Corra Linn, with a triple leap of 84 feet. Within four miles at this section the river descends from 560 feet to 200 feet. From Lanark to Bothwell it flows through a fertile and well-wooded country famous for its orchards and from that point its course is through the greatest mining and industrial district in Scotland. Passing through Glasgow, at Dumbarton (91 miles from its source) it begins to expand into an estuary and reaches the Irish Sea at the southern extremity of the Island of Bute. Its drainage area is 1,481 square miles. The estuary is indented by numerous lochs, affording panoramas of exquisite beauty, and it is dotted by numerous watering places (Gourock, Dunoon, Rottesay, Ayr, etc.). Its principal tributaries are the Douglass Water, the Mouse, the Lethan, the Avon, the Calder, the North Calder, the Kelvin, the White and Black Cart and the Leven. The Clyde by artificial deepening is now navigable by large ocean-going steamers to Glasgow, where, rather more than 100 years ago, there was only a depth of 15 inches at low water. It is the most important river for commerce in Scotland, with a great ship-building industry located on its banks in the section between Glasgow and Dumbarton.

CLYDEBANK, a police burgh and town of Scotland, in Dumbartonshire, on the north or right bank of the Clyde, about six miles west by north of Glasgow. It is of modern origin, its chief industry being ship-building. Pop. 16,202.

CLYDESDALE, a breed of horses named from the valley of the Clyde in Lanarkshire, Scotland. Clydesdales are about 16 hands high, are compact and muscular in build, and have a long, easy stride. They vary in color, being black, gray, brown or bay, and are used for draft-horses. Specially fine specimens of this breed are found in the eastern United States, in the service of the municipal fire departments of large cities. See Horse.

CLYDESDALE, or PAISLEY TERRIER. See Dog.

CLYMENE, klĭm'ę-nē, the daughter of Oceanus, and mother of Atlas and Prometheus.

CLYMER, klī'mėr, **Ella Dietz**, American poet: b. New York. She began her career as an actress in 1872, but in 1881 she abandoned the stage. She has published three volumes of poems: ‹The Triumph of Love› (1878); ‹The Triumph of Time› (1884); and ‹The Triumph of Life› (1885). She was one of the founders of the «Sorosis» Society, and its president in 1889.

CLYMER, George, American statesman: b. Philadelphia 1739; d. Morrisville, Pa., 23 Jan. 1813. He was orphaned at the age of one year, received an education at the College of Philadelphia (now University of Pennsylvania), entered mercantile life when a lad and acquired a competence. He was prominent in public affairs prior to the Revolution, and in 1772 was appointed by Governor Penn to the position of justice of the Court of General Sessions and of the County Court of Common Pleas of Philadelphia. In 1775 he became one of the first Continental treasurers. He was chosen in 1776 to succeed a member of the Continental Congress who had refused to sign the Declaration of Independence, to which he promptly affixed his signature, the 38th after John Hancock's. He was active in the patriot cause during the Revolution, served under Cadwalder in the battle of Princeton and was a member of the convention that framed the Federal constitution. In 1788 he was elected a member of the first Congress under that instrument. In 1778, he was one of the special commissioners sent by Congress to treat with the Indians at Fort Pitt. In 1790 he declined a re-election, and in the succeeding year was appointed collector of the excise duties on spirits, the collection of which in Pennsylvania led to the whisky riots. Clymer acted firmly, yet temperately in the troubles, till finding the office distasteful, he resigned it, and was appointed, with Pickens and Hawkins, to negotiate a treaty with the Cherokees and Creeks in Georgia. After this he retired from public life, but devoted much of his time to study. He became president of the Philadelphia Bank and the Academy of Fine Arts. No man was more averse than he to the assumptions of aristocracy, to the excellencies, honorables and esquires, who, he said, abounded more in the United States than in any other country in the world. He seldom spoke in public, but when he did his ideas were expressed in language keen, pithy and laconic. Consult Dickenson in the *Magazine of American History* (Vol. V, New York 1880).

CLYSTERS, an old term used to denote medicaments introduced into the lower bowel, usually for the purpose of expelling its contents. See Enemata.

CLYTEMNESTRA, klĭt-ĕm-nĕs'trạ, daughter of King Tyndareus and Leda, and half-sister of Helen. She bore her husband, Agamemnon, two daughters, Iphigenia and Electra, and one son, Orestes. During the absence of Agamemnon in the war against Troy she bestowed her favors on Ægisthus, and, in connection with him, murdered Agamemnon on his return from Troy, and, together with her paramour, governed Mycenæ for seven years. Her son, Orestes, killed them both.

CLYTIE, klī-tē, the daughter of Oceanus and Thetis, who pined away through love for Apollo, who deserted her for Leucothea. Through the pity of the gods, she was changed by them into a sunflower. The name the Greeks gave it was «hēliotropion,» of the same family as our heliotrope.

CNICUS (Latin for safflower, which name was first given to the thistle), a monotypic genus of the family *Asteraceæ*. The plant is an annual herb which came originally from the southern part of Europe, but is now sparingly naturalized in eastern North America. *C. benedictus*, or, as it is sometimes called, Saint Benedict's thistle, was formerly used as a febrifuge, but is now rather considered a tonic and diaphoretic.

CNIDUS, nī-dŭs, or **GNIDOS**, Asia Minor, a town in the province of Caria, at the extremity of the long narrow peninsula of Triopium. It was a favorite resort of Aphrodite (Venus), who was hence surnamed the Gnidian Goddess. Her temple here contained her statue by Praxiteles. Here in 314 B.C., the Athenian Admiral Conon defeated the Spartan fleet under the leadership of Pisander.

CNOSSUS, nō'sŭs, or **GNOSSUS**, more anciently Cnosus, or Gnosus, now Makro Teikho, the capital of Crete in the time of Minos, was built on the Cæratus, a short distance from the northern coast, and founded by Dorians, who diffused their institutions over the island. Homer mentioned it as already a great city, and the residence of the celebrated Cretan king; it long maintained its preponderance, until it was weakened by the growing importance of Cydonia and Gortyna. It was renowned in mythology by numerous legends of Jupiter, born, married, and buried in its vicinity; of Minos, Ariadne, the minotaur, and the labyrinth. In later times it became a colony of the Romans. Ænesidemus, the skeptic philosopher, and Chersiphon, the architect of the temple of Diana in Ephesus, were born there.

COACH, a large, closed, four-wheeled vehicle generally constructed to carry passengers inside and outside. It is used as a general term to cover all such vehicles, but the typical coach involves four wheels, springs and a roof. It took its name from the place whence it came, Kocs, a Hungarian town between Raab and Buda. The coaches of the Middle Ages were exceedingly elaborate and ornate. As late as 1550, Paris possessed only three coaches; Spain in 1631 could boast of a coach with glass windows in the possession of the Infanta.

In England a kind of carriage called a «whirlicote» was in use in the reign of Richard II; but coaches, properly so called, are stated by Stow to have been introduced in 1564 by a Dutchman, who became coachman to Queen Elizabeth. Stow adds:

> After a while, divers great ladies, with as great jealousie of the queene's displeasure, made them coaches, and rid in them up and downe the countrie, to the great admiration of all the beholders; but then by little and little they grew usual among the nobilitie, and others of sort, and within twentie years became a great trade of coach-making.

They were, however, for a long period confined to the aristocracy and the wealthy classes. Sometimes six or even eight horses were harnessed to the coach, partly no doubt for the sake of display, but chiefly because the wretched state of the roads required that number. At first coach-wheels were very low, which circumstance also contributed to prevent the attainment of any considerable speed, and to make it necessary to use several horses to draw them; and no one seems to have pointed out the advantages of large wheels until, in 1771, a Mr. Moore for a short time attracted a good deal of attention by pointing out the fact that it was much easier to draw a coach or cart with large wheels than with small ones, and by actually constructing a coach «very large and roomy,» which was «drawn by one horse, and carried six persons and the driver, with amazing ease, from Cheapside to the top of Highgate Hill,» coming back «at the rate of 10 miles an hour, passing coaches-and-four, and all other carriages it came near on the road.» A contemporary account states that this coach had two large wheels, nine and one-half feet in diameter.

Hackney-coaches (q.v.) were first used in London in 1625. They were then only 20 in number, and were kept at the hotels, where they had to be applied for when wanted. In 1635 an attempt was made to restrain their use by a proclamation of Charles I; but, this being found unsuccessful, their number was limited, and a commission was given to the Master of the Horse to grant licenses for their use. In this year only 50 were licensed. In 1634 one Captain Baily, who had formerly been a sea-captain, hit upon the plan of keeping a number of hackney-coaches, with drivers in livery, standing at a particular place (the «Maypole,» in the Strand), where they might be had whenever they were wanted. Hackney-coaches now rapidly became more general. The four started by Captain Baily in 1634 had increased to 200 in 1652, to 800 in 1710 and to 1,000 in 1771.

The following facts relating to the history of stage-coaches are taken from Chambers' 'Book of Days': Stage-coaches were introduced into England about the same time as hackney-coaches. The first stage-coach in London appears to have run early in the 17th century, and about the middle of the same century they appear to have become general both in London itself and in the better highways in the neighborhood. Before the end of the century they were started on three of the principal roads in England. Their speed at first was very moderate, about three or four miles an hour. They could run only in the summer, and even then their progress was often greatly hindered by floods and by the wretched state of the roads generally. In 1700 a week was considered a marvelously short space of time to take to travel from York to London; and even 60 years later a fortnight was spent in going between Edinburgh and London. The first stage-coach that traveled between Glasgow and Edinburgh, which was set on foot in 1749, occupied two days in the journey. The first efforts to accelerate the speed of traveling was made by a body of Manchester merchants in 1754, who started a conveyance to which they gave the name of the «Flying Coach,» and which was intended to cover the distance between Manchester and London in the unusually short period of four days and a half. In their prospectus, the proprietors of the new vehicle made the following announcement:

> However incredible it may appear, this coach will actually (barring accidents) arrive in London in four days and a half after leaving Manchester.

Thirty years later, Mr. Palmer, of Bath, after a considerable amount of opposition, succeeded in inducing the government to put in practice certain suggestions which he made, by which he showed that great saving both in time and money in the conveyance of passengers and letters would be effected. The result was the establishment of the system of mail-coaches, which continued to be the means of traveling in England until their place was taken by the railways. The first mail-coach started between London and Bristol on 8 Aug. 1784.

The introduction of steam and motor cars has gradually superseded the manufacture of coaches. But they are still made to some extent. The typical American coach is the Concord coach, so-called from the place of manufacture. Two famous coaches of Great Britain are the King's state coach, which was executed by Sir William Chambers, with paintings on the walls by Cipriani dating back to 1761; and the coach of the lord mayor of London of about the same date. Both are highly ornamented and the bodies are suspended on straps.

Coaching became a very popular exercise in the early 19th century. It required considerable skill to manipulate four spirited horses on the bad roads which were then available. The sport survived, in a more limited measure, the introduction of railways. In 1856, the Four-in-Hand Club was started in England; and the Coaching Club in 1870 as successor to the old Bensington Driving Club (1807–52). In America, the New York Coaching Club began in 1875. To-day the sport has developed, in great centres and cities of the world, in the form of horse-racing. For a history of vehicles and their manufacture, see CARRIAGE; CARRIAGE AND WAGON INDUSTRY.

Consult the Badminton, 'Driving' by the Duke of Beaufort (1888); Roger, 'Manual of Driving' (Philadelphia 1900); Nimrod, 'Essays on the Road' (1876); Adams, 'English Pleasure Carriages' (London 1837); Thrupp, 'History of the Art of Coach Building' (London 1877); Gilbey, 'Early Carriages and Roads' (London 1903); Straus, 'Carriages and Coaches: Their History and their Evolution' (London 1912).

COACH, or DALMATIAN, DOG. See DOG.

COACH HORN, a tapering horn of brass or copper used to sound a few simple calls. It has no keys and its range is limited to six open notes (C^1-G^1-C^2-E^2-G^2-C^3). The horn varies from 42 to 56 inches in length. The calls have a recognized place in coaching and were, of course, much more generally known in the days of the stage coach. To-day the horn like coaching is employed generally in connection with racing or by the few coaching clubs in the wealthier centres, as New York, London, Paris, Berlin, etc.

COACH-WHIP SNAKE, an American snake (*Zamenis flagelliformis*), characterized by a long, narrow head, projecting upper jaw, superior orbital plates large and projecting much over the eyes; nostrils large, lateral and near the end of the snout; eyes large, iris dark gray; neck small, body long and tail attenuated like a whip-cord, which it also resembles in the braided appearance produced by the arrangement and dark border of the scales. The color of the head, neck and a third of the body is glossy black, becoming paler toward the tail, which is tawny brown; the scales of the tail have dark margins; the lower surface in front is bluish slate, behind white clouded with brown; the colors vary in their shades, but near the head it is always black. They sometimes attain the length of seven feet. It moves with great swiftness, and feeds on young birds and small animals; though inoffensive to man, it defends itself bravely, twining its long folds around its enemy. The species is found in the South from the Atlantic to the Pacific. A red color phase is found in the West. The coach-whip snake is a congener of the black snake.

COADJUTOR, a Latin term, nearly synonymous in its original meaning with assistant, and applied by the Romans to a kind of deputies or lieutenants given to magistrates to assist them in a press of business, or supply their place in absence. The term was afterward introduced into the Church and given to persons who were associated with prelates, archbishops or bishops, to assist them or act as substitutes for them in the discharge of their functions. The appointment usually made the coadjutor the successor of his principal, and in this way great abuses arose. The abuse of appointing relatives in this capacity, making the office of bishop hereditary, made rapid strides until the Council of Trent introduced several reforms, by providing that the nominations of a coadjutor should not take effect except in cases of necessity or manifest utility, the Pope being made sole judge of these cases. Coadjutors, as now understood, are of two kinds, one temporary and revocable, allowed on account of illness or other incapacity, and allowing no right of succession; the other irrevocable and carrying with it the right of succession. The Council of Trent did not favor the «irrevocable right of succession,» but the Pope grants it in special cases. A coadjutor differs from a «suffragan,» in that the former is appointed to an old or infirm bishop, while the latter is assistant to a bishop whose see is too large, and has charge of a portion of it, the bishop remaining in charge of the central portion. The term and the office is not confined to the Roman Catholic Church; it is in use also in the Anglican Church.

COAGULATION (Latin, «to curdle»), the peculiar change from the state of a liquid to that of an amorphous solid, exhibited, under certain conditions, by proteid bodies and their solutions. The hardening of an egg by boiling is a familiar instance of the process. In this case the change is induced by heat, and begins when the temperature reaches 160° F. or thereabouts. Another familiar case is the clotting of blood, which occurs from a very different cause. The blood contains two albuminous substances which are concerned in the phenomenon, and which are known respectively as «fibrinogen» and «fibrinoplastic substance.» These are normally held in solution; but as soon as the blood is removed from the body they undergo a change whose nature is not well understood, the product of which is a stringy, elastic, fibrous or jelly-like solid known as «fibrin.» Casein, the principal proteid constituent of milk, does not coagulate from the direct application of heat, but it coagulates very quickly when rennet is introduced, and it also coagulates spontaneously under the influence of certain of the products of fermentation that develop in the milk after it has been exposed to the air for a time.

COAHUILA, kō-ā-wē'lā, Mexico, state bounded on the north by the United States, on the east by Nuevo Leon, on the south by San Luis Potosi and Zacatecas and on the southwest, west and northwest by Durango and Chihuahua. Its area is about 63,745 square miles. The capital is Saltillo. The principal mountain ranges are in the districts of Rio Grande and Monclova. Besides these we may mention the Sierra Madre, in the Saltillo district; the Sierra Paila, in Parras; and Sierra Noas, in Viesca. The rivers are Rio Grande (also called Rio Bravo), forming the boundary line with Texas; the Sabinas, forming the boundary between the districts of Monclova and Rio Grande; the Alamos, Monclova, Patos, Saltillo, Aguanaval, Nazas and their tributaries. The principal lagoons are those in the districts of Parras, Viesca and Monclova. Extending from the foot of the mountains northward are sterile plains, where the heat is intense; to the southeast lies the Laguna region, fertile and temperate; the mountainous district, rich in minerals, has frequent frosts. In general the climate is not healthful, the most common diseases being malarial fevers, typhus, rheumatism and affections of the respiratory and digestive organs. Mining has recently become one of the chief industries. Silver, lead, coal, iron, zinc, copper and gold are found. The first position, however, is still held by agriculture. Cotton, corn, wheat, sugarcane, etc., grow rapidly; and grape-culture is attracting special attention. The grapes of Parras are considered by some experts equal if not superior to the Malaga and Granada varieties. Cattle-breeding is carried on quite extensively. The export trade is principally with the United States, to which, among other products, are brought ixtle and its various manufactures. The commerce of Coahuila is in the hands of Americans, Spaniards, Germans and Frenchmen; its total trade is of the estimated value of $11,000,000, or $12,000,000, silver, per annum. Manufactures are cotton and knitted goods, wines, tanned skins and hides, soap, candles, cheese, shoes, molasses, furniture, pottery, carriages, wagons and chocolate. The railroad system includes a number of important lines. There are good wagon roads; also telegraph and telephone service and an efficient mail-service. The state is divided into five districts subdivided into 33 municipalities. Pop. 280,899.

COAITA, kō-ī'tạ. See SPIDER-MONKEY.

COAL, a mineralized form of carbon, constituting one of the metamorphic rocks. It is found in seams or beds, often in a series separated by intervening strata of sedimentary rocks.

Origin.— Many theories have been advanced as to the origin of coal. Thus coal beds have been attributed to the drying up of petroleum lakes on old land surfaces, to the separation of carbon by some fanciful chemical process from limestone and to accumulation of seaweeds along old ocean beaches. These theories may be dismissed without discussion; they may help explain some particular instance, but are so unsupported by facts that they are of no wide application. The generally accepted theory applies to practically all kinds of coal deposits and is, briefly, as follows:

When the woody material, cellulose, of the leaves and stems of plants, falls on the ground, it soon oxidizes or decays, and the oxygen, hydrogen, carbon and nitrogen present pass into the air or soil as gases, the hydrogen and oxygen chiefly as water vapor, the carbon as carbon dioxide and the nitrogen as ammonia. Finally of the original material, say the trunk of a great tree, only the ash, composed chiefly of silica, alumina and iron oxide, is left. Thus it happens that the leaves, twigs and branches that have fallen for thousands of years in a forest are represented by a few inches of vegetable mold or humus, plant substance not yet oxidized to ash. If, however, the ground be covered by water, as in a swamp, air is partly excluded, and decay proceeds so slowly that vegetable or animal remains may be preserved for long periods of time. Still oxidation goes on; the dead plants gradually give up their hydrogen, oxygen and carbon as water, marsh gas and carbon monoxide and dioxide, and change to a mass of partly decayed vegetable fibre or even to a black muck.

A damp climate and a land surface from which the rainfall runs off slowly, favor the formation of extensive swamps, though in a climate as damp as that of Ireland peat bogs climb hillsides, the mosses (*Sphagnum*), the chief plant growth in such swamps, dragging up water by capillary action. On the plains of Alaska and Siberia, where the ground is permanently frozen, mosses cover the ground with a thick mat, and such swampy plains are called tundras. In a lake country can be found areas which a little investigation shows were at no very remote date covered by shallow bodies of water, but are now swamps, the original lakes having been filled by the dead mosses, rushes and other aquatic plants. Along the seashore in a region of average rainfall, where the coast is of low relief and the rivers sluggish, sand-bars form by wave action off shore, and behind these bars are salt lagoons and marshes, changing, farther from the ocean, to brackish, and finally fresh-water, swamps.

Fresh or brackish water and a fairly warm though not torrid climate are indicated by the fossils of plants and animals found in or near coal seams. From these facts and from the vast extent of some coal fields it is believed that coal beds represent old coastal swamps, possibly of the type of the Dismal Swamp in Virginia. Now if we suppose such a swamp-covered coast to sink slowly, the encroaching ocean would cover the accumulated peat and muck with sand and silt until finally the swamp might be buried thousands of feet by sediments from the receding land surface. Instead of steadily sinking, however, the probabilities are that during the great coal-forming epochs the land alternately sank and rose through thousands upon thousands of years, and thus one swamp was buried over another, resulting in those alternating beds of coal, shale and sandstone characteristic of all coal fields.

The progressive diminution of hydrogen and oxygen compared with carbon is shown by the following table from Percy's 'Metallurgy,' in which carbon is taken at the constant amount of 100:

	Carbon	Hydrogen	Oxygen
Wood	100	12.18	83.07
Peat	100	9.85	55.67
Lignite	100	8.37	42.42
Welsh bituminous	100	4.75	5.28
Pennsylvania anthracite	100	2.84	1.74

The loss of water and of combined carbon, hydrogen, oxygen and nitrogen, in the change from peat to coal, caused a great loss of bulk. The pressure of overlying strata, or of those earth movements that warp and fold the rock formations, reduced the bulk still more. Thus it can happen that a coal seam one foot thick may represent what was 50 feet of peat in the ancient swamp, and it is fair to assume that an average seam of true coal is not one-fifth the thickness of the original peat beds.

Some geologists have believed that when the old swamps now represented by coal seams were accumulating thick beds of peat, the climate was torrid, while the earth's atmosphere contained a higher percentage of carbon dioxide than now. It may be said, however, that a torrid climate is not necessary for the existence of great swamps; and as to a higher percentage of carbon dioxide in the air, were the present land surface of the globe covered with a layer of coal one foot thick, the carbon contained therein, if restored to the atmosphere, would mean an increase in the amount of carbon dioxide of only about .5 of 1 per cent. This about represents the difference between air in the city and in the country, and the effect of such an increase in stimulating plant-growth is at best doubtful.

Following the submerging of the fallen vegetable substance biochemical changes take place through the action of certain bacteria and the material soon loses its vegetable structure and becomes metamorphic. Being later subject to stresses of earth movements, either through foldings of the strata, with more or less heat, or, through subsidence and the deposit of sedimentary rocks, to heavy pressures this metamorphic bacterial residue becomes a true rock. The great variation in its constitution is due to the endless variation of conditions during its transmutation.

As to the age of the coal formations it may be said that true peat deposits are all of later age than the Tertiary, and in North America only peat and incoherent lignite occur in later formations than the middle Tertiary (Miocene) though the early Tertiary (Eocene) formations contain great areas of lignite. In Europe there are lignitic deposits in the Triassic and in the Carboniferous. The great coal-forming age in North America and in Europe was the Carboniferous, though true coals occur in the Permian and in the Triassic, and in North

America there are very important coal fields of Cretaceous Age. Isolated pockets of coal, but no workable coal fields, occur in pre-Carboniferous formations. See CARBONIFEROUS SYSTEM.

An idea of the relative compositions of peat, lignite, and true coals may be had from the following table:

	H_2O	C	H	O	N	S	Ash
Condensed peat....	20	47.2	4.9	22.9			5.0
Lignite, Alaska....	16.52	55.79	3.26	19.0	.61	.63	4.18
Bituminous coal, Connellsville, Pa.	0.89	82.48	4.50	5.61	1.45	.94	34.1
Anthracite coal, Lykens, Pa......	0.73	82.89	4.53	.40	.64	.68	10.13

Varieties of Coal.— Various elaborate schemes of classifying coal have been advocated, but have not gained popular acceptance. In fact in the coal trade in this country the word coal is often applied to a true lignite. However, since the chief heat-producing element in coal is carbon, a classification in wide use is based on the value of the coal as fuel; that is, on the percentage of carbon present and the condition of the carbon.

Part of the carbon is fixed, that is, cannot be driven off by heating in a retort; part is combined with the hydrogen and nitrogen as volatile hydrocarbon compounds which can be driven off. The percentage of fixed carbon is highest in anthracites, but even the semi-graphitic anthracite of Rhode Island contains a considerable percentage of hydro-carbons. The proportion of the volatile hydro-carbons to the fixed carbon in a coal is called its fuel ratio. On this basis the distinctions usually made are lignite, bituminous, semi-bituminous, semi-anthracite and anthracite. Cannel coal, in which the percentage of volatile hydrocarbons is very high, is believed to be of different origin from other coals. It may represent accumulations of seeds, spores, resins or gums, and possibly of fish remains, in pools in the ancient swamps. Generally speaking, in anthracite the volatile matter is below 6 per cent, in semi-anthracite below 10 per cent, in semi-bituminous between 12 and 18 per cent and in bituminous above 18 per cent. In cannel coal the volatile matter may be as high as 50 or even 65 per cent.

Lignite, or brown coal, is brown to black in color, though the powder is always brown. It often shows plainly its vegetable origin, containing stems that look like undecomposed wood. The lustre may be resinous or dull; the specific gravity is .5 to 1.5, some kinds floating on water. Lignites burn easily with a smoky flame, generally contain a high percentage of water, crumble easily and slack to mud on long exposure.

Bituminous or soft coal is black; the powder is black; the lustre may be resinous or dull; the specific gravity is 1.25 to 1.4. It contains less water than lignite and bears transportation better. Bituminous coals are subdivided according to their properties or uses, into coking, free-burning, smokeless, gas coals, etc. Coking coals partly fuse or cake in burning. If low in ash and very low in sulphur they are highly valued for forging and for making coke and gas. The famous coals of the Cumberland region in Maryland are classified as semi-bituminous. In coking coals the less volatile hydrocarbons present, the higher the yield of coke, but in gas coals the more hydrocarbons the better. A good gas coal will give 10,000 cubic feet of gas per ton. Smokeless coals burn with little smoke and are used for domestic purposes and for steam production.

Cannel coal (from *cannyl*, "a candle"), is black or brownish, has a dull lustre, does not soil the fingers and shows few or no traces of vegetable structure. It grades into bituminous shale. It contains from 40 to 60 per cent of volatile matter, lights readily, burns with a steady flame, and is used as a fuel for open grates, but chiefly for enriching gas made from other coal. It is mined in the United States at Cannelburg, Ind., and in the Jellico district, Ky.

Anthracite, called also hard coal, is black with a black powder and does not soil the fingers. The specific gravity is 1.3 to 1.75. It kindles slowly, but, owing to the high percentage of fixed carbon, burns without smoke and gives an intense heat. It was formerly much used in this country for smelting iron and is still used as a steam fuel, but its chief use is for household purposes.

Generally speaking, the less water, ash and sulphur in a coal the better. The water must be evaporated before the coal burns; ash represents inert matter and sulphur is objectionable for several reasons. A first-class coal should not contain over 6 or 7 per cent of ash and a good gas coal should have less than .7 per cent sulphur.

The following table gives the composition of some representative American lignites and coals:

	Water	Volatile Hydrocarbons	Fixed carbon	Fuel ratio	Ash	Sulphur
LIGNITE						
Cook Inlet, Alaska.....	11.59	49.03	31.64	.64	7.73	....
Coos Bay, Ore........	9.56	49.85	35.98	.74	4.61	.94
Rock Springs, Wyo....	6.98	34.42	52.60	1.53	2.00	....
Boulder, Colo.........	21.37	33.38	40.31	1.21	4.95	....
BITUMINOUS						
Roslyn, Wash.........	2.05	33.55	54.55	1.63	6.85	.11
Trinidad, Colo.........	4.88	36.25	53.57	1.48	5.30	....
McAlester, I. T........	2.08	37.52	56.02	1.49	4.38	.80
Saginaw, Mich........	5.82	39.79	45.15	1.13	9.24	3.83
Brazil, Ind............	13.82	35.16	49.60	1.42	1.06	1.47
Pana, Ill..............	1.94	36.59	58.32	1.59	2.24	.90
Clearfield, Pa.........	.55	25.19	71.02	2.82	2.65	.58
Connellsville, Pa......	1.26	30.11	59.61	1.98	8.23	.78
Pratt Seam, Ala.......	1.00	32.17	63.37	1.97	3.34	1.04
SEMI-BITUMINOUS						
Spadra, Ark...........	1.11	11.28	72.84	6.46	12.04	2.74
Pocahontas, W. Va....	1.68	17.45	75.90	4.35	4.20	....
Cumberland, Md......	.96	19.14	72.71	3.80	6.41	.79
SEMI-ANTHRACITE						
Crested Butte, Colo....	.72	7.62	87.51	11.48	4.15	....
Bernice, Pa...........	1.29	8.10	83.34	10.28	6.23	1.03
ANTHRACITE						
Cerillos, N. M.........	2.90	3.18	88.91	27.96	5.21	....
Wilkesbarre, Pa.......	2.49	4.34	83.97	19.33	8.55	.65
Lehigh, Pa............	1.72	3.52	88.00	88.49	5.66	.61

Coal Fields of the World.— North America, Europe and Asia contain the great coal fields of the world. In southern Africa, in Australia and in New Zealand are deposits of importance. Only small and disconnected areas are known in South America and the only mines worked on a large scale are in Chile and Argentina. As to Asia, the coal fields of China are vast and of great promise but are still practically undeveloped. Coal is abundant in India and Burma and the output is increasing fast, particularly from the mines in Bengal. The rather small coal field of Japan is being opened rapidly. The chief coal-producing states of Australia are New South Wales and Queensland. The South African mines are in Cape Colony, Natal and the Transvaal.

Great Britain long led the world in coal-production, but was passed by the United States in 1899. The important coal fields of Great Britain lie in southern Scotland, stretching, with interruptions, from the coast of Ayr to the mouth of the Firth of Forth; in the north of England, in Durham and Northumberland counties; in central England, where the several fields worked include parts of 10 counties, the most important being Yorkshire and Lancashire; in the west of England, near Bristol, and in the Forest of Dean; and the very important South Wales field in the counties of Monmouth (England), and Glamorgan and Carmarthen (Wales), this field producing the best coal mined in Great Britain.

On the continent of Europe, Germany, France, Belgium, Russia, Austria-Hungary, Italy, Sweden and Spain have coal fields of more or less importance. The French coal fields may be grouped in three divisions, those of the north, of the centre and of the south. The northern field, in the departments du Nord and Pas de Calais, extends into Belgium. The fields of central France are generally small and irregular, the most important being in the department of the Loire. In the south of France the coal fields of Alais and of the Aveyron are of some importance. The coal field of Belgium is a narrow belt extending across the country, except for a short interruption, from the Pas de Calais in France to the Aix-la-Chapelle coal field in Prussia.

Of the German states, Prussia has the largest and best coal fields. These include the Aix-la-Chapelle and the Eschweiler; the very important coal fields of the Ruhr, or of Westphalia; and, extending into Bavaria, the Saarbrücken field, perhaps the most remarkable in Europe for the number of seams and total thickness of coal. In the extreme southeast of Prussia are the important and comparatively undeveloped coal fields of Silesia at the head waters of the river Oder. Of the other German states, Saxony is a considerable producer of coal, the most important mines being near Zwickau.

In Austria-Hungary, coal fields extend from Lower Silesia into Bohemia, and from Upper Silesia into Moravia with mines near Schlan, Radnitz and Pilsen. There are also great deposits of lignite, extensively developed near Einbogen and Bilin, and valuable mines of lignitic-bituminous coal near Fünfkirchen in southern Hungary and about Syria and Carinthia in the Austrian Alps.

The most important coal field of Russia is the Donetz basin, between the Don and the Dnieper rivers. It covers a large area and is being developed steadily. Spain has several coal fields, one of some importance in the Asturias, and two others but little developed. Lack of railroads has prevented their exploitation.

North America, as noted before, surpasses all the continents in the extent and variety of its fuel supplies. The United States leads the world in coal production, and there is little prospect of any country surpassing it before that far distant day when the great coal fields of China are well opened. Canada has coal fields of importance near Pictou and on Cape Breton Island in Nova Scotia, known as the Acadian coal field; also a vast and but partly developed field of lignite and true coal in Alberta and eastern British Columbia, and another field on Vancouver Island. Alaska has workable beds of lignite on the coast and in the Yukon Valley at Rampart and Circle City.

The Mexican coal fields are of much local importance, but are not likely to produce any coal for export. The principal field is in the state of Coahuila, extending from Eagle Pass to Sabinas. Coal seams have been worked in Sonora, Hidalgo and Michoacan. During the past five years the output of coal in Mexico has greatly decreased on account of the unsettled political conditions.

The following table showing the production of coal and lignite of the chief coal-producing countries of the world is compiled from the United States Geological Survey figures:

Country	Production	Country	Production
United States	531,619,487	China	24,000,000
Great Britain	283,570,560	Japan	22,596,750
Germany	259,139,786	France	19,908,892
Austria-Hungary	52,679,712	India	19,156,404
		Belgium	15,691,465
Russia	31,158,400	Canada	13,269,023

In 1913 the world's production of coal had reached the enormous total of nearly 1,500,000,000 tons. On account of the unsettled conditions brought about by the war, there was a decrease in 1914, but the output for 1915 exceeded that of 1913. According to statistics compiled by the *Coal Trade Journal*, the output in the United States during 1915 amounted to 525,124,700 tons.

During the past 15 years the production of coal in the United States has exactly doubled; that of Great Britain has increased one-fifth while Germany's production has increased 80 per cent during the same period. Our annual tonnage now almost equals the combined production of Great Britain and Germany.

The coal fields of the United States, not including Alaska, are of various ages from the Carboniferous to the Eocene, the two great horizons being the Pennsylvanian of the Carboniferous, and the Laramie of the Cretaceous. The total area covered by possibly productive seams of lignite, bituminous coal and anthracite is over 450,000 square miles.

Of these vast reserves about 60 per cent is soft coal, including sub-bituminous and lignite, the rest being hard coal, or anthracite, semi-anthracite and bituminous.

According to recent classification made by the United States Geological Survey, the coal fields of the United States are divided into six "provinces," on a geographical basis, as follows: (1) Eastern province, including the bituminous area of the Appalachian region; the Atlantic Coast regions, comprising the Triassic fields near Richmond and the Deep and Dan Rivers' fields of North Carolina and the anthracite regions of Pennsylvania, in all 70,000 square miles. (2) Gulf province, including the lignite fields of Alabama, Mississippi, Louisiana, Arkansas and Texas, comprising 2,100 square miles in which there have been actual development with areas believed to contain workable lignites embracing 78,000 square miles. (3) Interior province, including all the bituminous regions of the Mississippi Valley and the coal fields of Michigan, covering a total area of 132,900 square miles. (4) Northern and Great Plains provinces, including the lignite areas of North and South Dakota, and the bituminous and sub-bituminous areas of northeastern Wyoming and northern and eastern Montana, covering 88,590 square miles. (5) Rocky Mountain province, including the mountain regions of Montana and Wyoming and the coal fields of Utah, Colorado and New Mexico, an area of 37,000 square miles. (6) Pacific Coast province, including the coal fields in California, Oregon and Washington, an area of 1,900 square miles.

Owing to the competition of lower-priced bituminous coal in the form of coke, the use of anthracite for smelting iron has declined greatly of late years, and its consumption for industrial purposes is not increasing. For steam-production only the small sizes, pea, wheat, buckwheat and rice, are much used, and these chiefly on railroads running through the fields or in cities having strict smoke ordinances. Anthracite, being clean, smokeless, having great heating power, and burning slowly, is chiefly used for household purposes and is sent to market broken into lumps of several sizes, known as broken or grate, egg, stove and chestnut, these being called prepared sizes, in distinction from the small or steam sizes before mentioned. The market supplied by the Pennsylvania mines is along the Atlantic seaboard from Nova Scotia to Georgia, also a narrow strip of country extending from Montreal westward through southern Ontario and the States of the Union bordering on the Great Lakes. The three States of Pennsylvania, New York and New Jersey consume over two-thirds of the anthracite and about half of the rest goes to New England; thus almost 80 per cent is consumed in the East.

The bituminous coals of the Appalachian field include gas, coking and steam coals of the highest grade. The largest and best seams or those most easily opened have been exploited so far, and the resources of the Appalachian field are still enormous. The State of West Virginia alone is estimated to contain more workable coal than the whole of Great Britain. The best-known of the various areas now opened are the Clearfield, in Pennsylvania, producing coking, gas and steam coals, shipped largely to seaboard points; the Broad Top, in Pennsylvania, producing coal of rather better grade, shipped to the same markets; the Cumberland, in Maryland, producing a famous steam and smithy coal, shipped to the seaboard and to interior cities from Canada to the Rocky Mountains; the Pittsburgh, in Pennsylvania, whence come gas and steam coals largely used locally, but also shipped to points on the Great Lakes and on the Ohio River and lower Mississippi; the Connellsville, in Pennsylvania, yielding coal used chiefly for making a standard grade of coke; the Hocking Valley, in Ohio, whence are shipped steam coals to near-by cities and to distant ports on the Great Lakes; the Kanawha, in West Virginia, shipping gas and steam coal to various points on the Great Lakes or on the Ohio River and lower Mississippi; and the New River, Flat Top and Pocahontas fields in West Virginia, producing steam, gas and coking coals of varying excellence, the best grades having no superior, which are shipped mostly to seaboard points, though an increasing tonnage is made into coke to supply blast furnaces at Pittsburgh, Chicago and various Ohio cities. In eastern Kentucky is the Jellico field, whence gas and steam coal is shipped to a wide territory, including seaboard cities, and in eastern Tennessee are several basins yielding gas, steam and cooking coals, used locally and shipped to compete with the Jellico coal. The important district in Alabama is about Birmingham: the coal is shipped to Atlantic and Gulf ports for steam- and gas-making, and a large proportion of the output is made into coke for use in local furnaces and foundries.

The eastern interior field covers western Indiana, nearly the whole State of Illinois and part of Kentucky. The coal is of Carboniferous (Pennsylvania) Age, but in general lies in thinner veins and is of poorer quality than that of the Appalachian field. Most of the output is used as a steam fuel by railroads and in the many manufacturing cities that lie in or near the field. Certain grades are much used as a household fuel. The field contains no first-class coking coal.

The northern interior field covers a large area in the southern peninsula of Michigan and has been opened chiefly by the mines near Bay City and Saginaw. The seams are comparatively thin, and the coal is generally of poorer quality than that of Indiana and Illinois. The output is used locally. The beds are of Upper Carboniferous Age.

The west central field extends from western Iowa across western Missouri and into northwestern Arkansas and eastern Nebraska and Kansas, through Oklahoma into Texas. The coal beds vary widely. In parts of the field the coal is barely more than lignite, while in northwestern Arkansas it approaches semi-anthracite. The markets supplied cover a great area. Fully half of the output is used by railroads, and of the other half at least 40 per cent is used for household purposes. The measures are Carboniferous.

The Rocky Mountain field includes the numerous disconnected areas lying in narrow belts along either flank of the range from the Canadian frontier southward for 1,000 miles; Montana, Utah, Wyoming, Colorado and New Mexico having mines. Along the flanks of the mountains and in the parks or plateaus in the main range the coal is largely bituminous; but eastward from the range the coal measures, which are of Upper Cretaceous (Laramie) Age, are lignitic, and vast beds of lignite underlie the plains of Montana, Wyoming and North and South Dakota. The mines now opened supply the great transcontinental railroads, the chief users. In places the coals make good coke, used by local smelting plants. The resources of the field are vast and but little developed.

The Pacific Coast coal field is of Tertiary Age and most of the output is lignite. It includes some unimportant basins in California, several fields in Oregon, of which the Coos Bay has been most developed, and the Roslyn and Puget Sound fields in Washington, the former producing a good bituminous coking coal. The California and Oregon fields are of little more than local importance, but the Washington mines supply railroads and steamships and are an important factor in the coal trade of San Francisco.

The rank of the principal coal-producing States is shown by the following table compiled from figures published in the 1915 report on the «Production of Coal» prepared by the United States Geological Survey:

States	Short tons	States	Short tons
Pennsylvania { Anth.	88,995,061	Kansas	6,824,474
Pennsylvania { Bitum	157,955,137	Wyoming	6,554,028
West Virginia	77,184,069	Tennessee	5,730,361
Illinois	58,829,576	Maryland	4,180,477
Ohio	22,434,691	New Mexico	3,817,940
Kentucky	21,361,674	Missouri	3,811,593
Indiana	17,006,152	Utah	3,108,715
Alabama	14,927,937	Montana	2,789,755
Colorado	8,624,980	Washington	2,429,095
Virginia	8,122,596	Texas	2,088,908
Iowa	7,614,143	Arkansas	1,652,106
Oklahoma	7,435,906	Michigan	1,156,138

The coal reserves of the United States lying not deeper than 3,000 feet are estimated at 3,350,000,000 tons; 1,000,000,000 being in the Appalachian fields and 2,350,000,000 in the Rocky Mountain and Great Plains fields. Up to the close of the year 1916 the output of all the mines was in round numbers, 11,500,000,000 tons, and as half a ton of coal is wasted for every ton produced and sold, it is estimated that the total exhaustion of the country's coal fields to the date cited amounted to 17,250,000,000 tons. As compared with the amount of coal existing in all the United States fields, this exhaustion amounts to one-half of one per cent of the supply; and, at the present rate of use there is coal enough underground to supply the country for about 4,000 years to come.

The coal being consumed at present in the United States comes: from the anthracite fields of Pennsylvania, 70 per cent; from the bituminous coal area of the Appalachian area, 20 per cent; and from the great Western fields, 10 per cent. Although the anthracite area in the northeastern part of Pennsylvania is less than 500 square miles, it has yielded in the aggregate 2,626,500,000 tons, and it is estimated that four times that quantity remains untouched. Fully 70 per cent of the country's coal lies west of the Mississippi, but it is mostly of semi-bituminous and lignite grade. The high grade bituminous coal of the Appalachian area is being exhausted more rapidly in proportion to the supply than even the very limited anthracite deposits, and geologists assert that its complete exhaustion is not far off. See FUELS.

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RICHARD FERRIS,
Editorial Staff of The Americana.

COAL CITY, Ill., village of Grundy County, 60 miles southwest of Chicago, on the Atchison, Topeka and Santa Fé, the Chicago and Alton and other railroads. Coal mining is the chief industry, followed by manufactories of clothing and bricks and tiles. Pop. 2,667.

COAL GAS, the gas produced by the destructive distillation of bituminous coal. See GAS, ILLUMINATION, HISTORY OF.

COAL GAS POISONING. See CARBON-DISULPHIDE; COAL MINING; GAS POISONING.

COAL LANDS. On 1 July 1864 the first act which specifically mentions coal lands in the public domain became law. This law fixed the minimum price at $20 per acre but in 1873 an act was passed reducing the price to $10 per acre where the land purchased was situated more than 15 miles from a completed railroad. Only 160 acres are allowed to individuals, whereas associations may enter 320 acres, or twice that number after they have expended $5,000 in development. An effort has been made to induce Congress, as part of the program to conserve the natural resources of the country, to provide for the lease or sale of coal deposits without the rights to the soil, subject to various regulations. Up to 1 Nov. 1910, pending legislation, more than 80,000,000 acres of coal lands had been withdrawn from entry. On 22 June 1910 an act became law providing for the entry of coal lands as agricultural lands, but to the United States is reserved all right and title to any coal in such lands and the right to prospect for, mine and remove the coal.

By act of 6 June 1900 such of the public land laws as related to coal lands were extended to Alaska but since these laws contemplated a public survey before location a supplementary act was passed 28 April 1904 permitting individuals to locate claims of 160 acres (at a flat rate of $10 per acre) by permanent monuments, and when entry applications were made (within three years) they were to be accompanied by plats and notes of private surveys. Individuals soon learned that conditions in Alaska prevented the profitable working of a 160-acre claim independently and accordingly on 28 May 1908 Congress passed a remedial act permitting the consolidation of individual claims located in good faith up to 2,560 acres of contiguous land, but the act contained a stringent anti-monopoly provision. On 12 Nov. 1906 an executive order was issued withdrawing all coal lands in Alaska from entry under the coal land laws, but a later order modified this so as not to apply to claims which had been made prior to that date. In 1914 another act was passed to settle the disputed question of Alaska coal lands, a part of the lands being reserved and the rest arranged in such a way as to prevent the monopoly of the coal deposits by any co-operation. On 30 Dec. 1914, the United States Commissioner of Public Lands issued an order under the provisions of which several local permits have been issued for the free mining of coal lands comprising 10 acres or less. There have been several accusations made against public officials in connection with the methods of acquiring these lands, which led to the Ballinger-Pinchot controversy, the Congressional investigation of the Interior Department and the Forest Service, the dismissal of Pinchot and Glavis and the subsequent resignation of Secretary Ballinger. See PUBLIC DOMAIN; LANDS, PUBLIC. Consult ‹Public Coal and Public Rails and Private Farms and Private Gold in Alaska,› in *Everybody's Magazine,* Vol. XXXII, pp. 781–82 (June 1915); U. S. General Land Office, ‹Coal Land Laws and Regulations Thereunder› (Washington); ‹Undeveloped Coal in the Public Domain of Alaska,› in *The Outlook,* Vol. XCIV, pp. 505–06 (5 March 1910); Van Hise, C. R., ‹Conservation of Natural Resources› (New York 1910).

COAL MEASURES. See COAL; CARBONIFEROUS SYSTEM.

COAL MINING. Coal mining differs from metalliferous mining chiefly in the better ventilation required, the extent and regularity of mine workings and the necessity of getting out the mine product with as little dust as possible. The principal gases found in coal mines are carbon dioxide, CO_2, heavier than air, suffocating, but not inflammable, called choke-damp by miners; carbon monoxide, CO, about as heavy as air, poisonous and inflammable, the dreaded white-damp of the miners; carburetted hydrogen, CH_4, light, not poisonous but inflammable, the chief constituent of fire-damp; also, but less important, sulphuretted hydrogen, poisonous and inflammable, but easily detected by its odor. Of these gases, marsh gas, given off in large quantities in some mines, is the chief agent in coal-mine explosions. A mine is said to be fiery when the coal-seams give off much fire-damp. Many of the deeper coal mines of Great Britain, France and Germany are very fiery. The most fiery mines in the United States are in the anthracite region of Pennsylvania, the South Wilkes-Barre shaft at Wilkes-Barre being one of the most fiery mines in the world. A mixture of marsh-gas and air in certain proportions explodes violently on contact with flame. Coal-dust in the air makes a much smaller proportion of marsh-gas an explosive mixture.

To enable men to work in places where sufficient air to carry away the gas does not circulate, or to enable them to work in very fiery mines, safety-lamps are used. In a safety-lamp the flame is enclosed by wire gauze and cannot ignite gas in the air outside the gauze, unless the gauze is heated to the combustion point of the gas. The safety-lamp was invented by Sir Humphry Davy in 1815 and has been improved in various ways. Many patterns are in use; one of the latest types used in this country is an electric lamp, to which is attached a lead-plate battery, carried on the belt, a cable connecting it with the lamp, which is held in a steel shell, carried on the cap. A safety-lamp indicates the presence of fire-damp by the lengthening of the flame.

Carbon dioxide and carbon monoxide given off by the coal in place are produced in the mined-out areas known as «gob.» These gases are the chief constituents of after-damp, the gases resulting from an explosion of dust or fire-damp. They, rather than the shock, cause the terrible loss of life in mine explosions, since men may be killed by carbon monoxide without knowing they are in danger.

Good ventilation is thus a prime necessity in coal mining. It is sometimes secured by a furnace over a shaft, the fire producing a sufficiently strong up-current. But in all fiery mines, and generally in all large mines, large revolving fans, sometimes 35 feet in diameter, are used to circulate the air. The fans may exhaust or force in air (up-draft or down-draft); various types of mine fans are used, but the majority of those in service in Great Britain and at the larger mines in this country are modifications of the Guibal type.

As most coal-seams worked are a few feet thick, but of considerable extent, and as in this country at least, most coal-beds lie flat or dip at low angles, a coal-mine can be opened in a more regular way than a metalliferous mine. Two systems of mining are used — the pillar and room («board and pillar»), and the long wall. The first, generally used in the United States, consists in taking out various portions of the coal as the work proceeds from the mine-opening, and the remainder in working back toward the opening. The long wall system, used in certain bituminous districts in the United States, and extensively used in England, consists in taking out all the coal in a long face as the work advances from the mine-opening, the roadways and air-passages being protected by packs or walls. It is best suited for thin coal-seams with weak roofs, while the pillar-and-room system is best suited for thick seams with rock roofs. The two systems grade into each other.

Coal is broken from the face of the seam by the miner under-cutting it with his pick and then putting in a blast strong enough to bring down the coal. Black powder is generally used in this country. Abroad explosives making less flame are required by law in many districts, and in some of the very fiery German mines wedges operated by hydraulic power are used. Blasting, or «shooting off the solid,» is practised extensively, entirely in some sections, 15 per cent of the total production being so mined in 1915, but it is considered a wasteful and a dangerous method, as it not only causes cave-ins, but shatters the coal. Fine coal is less valuable than lump, and dust greatly increases the danger of an explosion.

To under-cut the coal, machines are sometimes used. Those in general use in this country are of two types: the Harrison, or puncher type, with a reciprocating piston impelled by compressed air, carrying a cutting bit; and the chain machine, having an electrically driven chain carrying cutting teeth. The latter type, though not favored for fiery mines, is probably more used in newly opened mines, than the former. No machines are used in the Pennsylvania anthracite mines. Of the total bituminous coal (442,624,436 tons) mined in the United States in 1915, 243,237,551 tons were under-cut by machines.

There has been a steady tendency toward the increasing use of machinery. In 1903 only 27.6 per cent of the total production of bituminous coal in the United States was machine mined. In 1910 it had increased to 41.7 per cent and in 1915 it was over half — 55 per cent. In that year 15,692 machines were in operation in the coal mines of the country, distributed (in part) as follows: Pennsylvania, 5,935; West Virginia, 2,479; Illinois, 1,787; Ohio, 1,459; Kentucky, 1,399; Indiana, 660; Alabama, 373; Colorado, 299.

Recently steam shovels have been employed in mining bituminous coal in Kansas, Oklahoma, Missouri, Indiana and Illinois, where there are areas of flat-lying coal veins near the surface. Some of these shovels have a dipper capacity of eight cubic yards.

The coal, when broken down, is roughly sorted by the miner or his helper and loaded into mine cars which are hauled to the main haulage roads by mules. Here the cars from the various gangways are usually made up into trains (or «trips») and hauled to the shaft bottom or the entrance of the mine by a wire rope (tail-rope haulage), by a compressed air locomotive, or by an electric locomotive. Sometimes the cars are attached singly to an endless wire rope like cars on an ordinary surface cable road (endless-rope haulage). Mines of the shaft type are to be found in largest numbers in the hard-coal districts. The hard-coal mines are likewise the deepest. Occasionally an extreme depth of 1,500 feet is attained. Two other styles of mines are found in both anthracite and bituminous fields,—«drifts» and «slopes.» The drift mine is dug straight into the mountain from one side. The passageway or heading may have an upward trend. The slope mine slants downward to the extent of perhaps 35 or 40 degrees, the main heading often measuring a mile or more in length.

An interesting process also is «pocket mining,» but this is practised comparatively little to-day. An outcrop of coal at various points on the side of the mountain suggests the possibility of a rich mineral vein. Digging is begun directly into the bed of coal projecting at the surface. This form of mining is seldom highly profitable, for when the digging has progressed at considerable expense to a point where the mine should be expected to pay, all operations are suddenly cut short by the encountering of solid rock, which, owing to some upheaval of the past, has «faulted» the vein of coal from its natural course. These pockets at intervals in the mountains where pocket mining is done present an interesting sight. About Shickshinny, Pa., they are numerous.

In shaft mines, and especially those of anthracite, mules are used very extensively. Where mechanical power is employed to haul trains in the main haulage-ways, these beasts bring the cars only from the side headings or the rooms. The mules do not see daylight for months at a time. In bituminous drift mines evolution has included the introduction of miniature trolley trains of 40 or 50 cars, each train being in charge of a motorman and brakeman. In anthracite drifts steam locomotives of a small and peculiar type, known as «hogs,» haul the trains. In a slope mine cable trains transport the coal. One end of the cable is attached to the train, and the other winds upon a drum at the power-house. When the cable turns a corner it passes around what is known as a «bull wheel.» Twenty-five one-ton cars may comprise a cable train of soft coal. Anthracite cars often hold four and a half tons. In soft-coal mines the man in charge of the cable train is called a «rope rider.» In bringing his cars out of the mine he sits upon the ring which connects the cable with the train. In the anthracite slopes a man stands upon the side of a car ready to «sprag» the wheels when a stop is made. Spragging consists in throwing short but stout lengths of wood into the openings between the four spokes of the car wheel. The height of the bituminous vein is often not more than four or five feet, thus making the quarters of the miners rather cramped. In the mining of anthracite only two-thirds loosened from the vein is of value. The miner must use good judgment in loading only the paying coal. To handle and transport chunks in which slate predominates is unprofitable. Even the better coal has more or less slate in it, while in bituminous coal the slate is principally at the top and bottom of the vein and not mixed with the product as mined.

Off from the main or side headings of a hard-coal mine «breasts» or «chambers» are opened. In bituminous fields these are known as «rooms.» A tunnel or neck 40 to 60 feet long may connect the room proper with the main passageway. Beyond the neck the chamber may broaden out to a width of 30 or more feet, continuing indefinitely. The coal between the rooms forms what is known as a «rib» or «pillar.» As the rooms begin to broaden to their maximum widths, timber props are placed between the floors and ceilings to support the loose rock and earth. Apart from supporting the great mass of solid rock, they are of little service.

When all the coal that it is practical to mine in the chambers has been extracted, the work of drawing the ribs between the rooms is begun, eventually allowing the rock above to cave in. In addition to securing the coal in the ribs, this process is necessary, that the weight of the mountain bearing upon the entrance to the mine may be lightened. As mining progresses, the weight is thrown upon the main heading, until, were it not for the drawing of the ribs, this main passageway would close.

When drawing a rib, the soft-coal miner keeps but one car beside him. He cannot tell how much of the rib he will able to remove before the rock above his head will fall. The first warning of approaching danger is a drumming noise from the layer of stone overhead. Sometimes this noise may be heard hours before the final crash; in anthracite mines it may be perhaps weeks before. Again, it may come with marked suddenness.

The coal, when brought to the surface, is screened, and at many bituminous mines is then shipped as lump and slack. Sometimes it is broken and washed, and in the anthracite region of Pennsylvania, where coal is shipped in seven or more sizes, the coal, as it comes from the mine, is passed through the breaker.

A modern coal breaker built on the side of a hill at Mocanaqua, Pa., will serve to illustrate the construction and operations connected with this important branch of coal-production. This breaker is 300 feet in length and 180 feet in height. It is capable of turning out 1,000 tons of clean coal per day. Some breakers have a much larger capacity. The Mocanaqua breaker was originally built at a cost of $50,000, but with recent improvements and the installation of the latest machinery its total cost reaches $100,000. It is heated by steam.

The anthracite is brought to the head of the breaker over a little railway leading from the mine in the side of the mountain. The coal, when dumped from the cars, passes over a screen 30 feet in length, through which the fine coal sifts. The big chunks next pass to the breaker proper, where rolls with sharp teeth crush it. It next runs into a screen which is cylindrical in shape, and not unlike a locomotive boiler in appearance. As the coal is handled in this device, it falls through perforations of different sizes, each size dropping into a separate chute. On benches at intervals on these chutes, sit the breaker boys, presided over by a foreman. As the coal passes slowly down the chute at their feet, these lads pick the slate from it and throw the refuse into a parallel chute. The inexperienced boys are always at the upper end of the chutes. They succeed in picking a part of the slate from the coal, and then it passes to the next workmen in line, who continue the operation until, by the time the product has reached the boys at the bottom of the chutes, it is pretty well cleaned. The coal is also washed to free it from sulphur. From the chutes the various-sized coal finds its way into bins, from which it is discharged into cars.

Mechanical contrivances for sorting have recently been installed at great cost in modern breakers. These inventions are spiral in shape, and provide for ridding the coal of much of its slate by centrifugal force. But even with these machines the final operation must be performed by boys or men.

A large amount of the soft coal of Ohio and Pennsylvania is brought to the lower harbors of the Great Lakes, bound for the Northwest and Canada. The cars which carry this coal have a capacity of 100,000 pounds, whereas, in the early days of the coal industry in this country, coal cars scarcely carried 1,800 pounds. On reaching the lake ports, coal for Canada may be taken 60 miles across Lake Erie in car ferries. But the bulk of the coal that comes to the lake ports is unloaded directly into the holds of lake vessels by means of most wonderful and massive machines, which pick up a 50-ton car and dump its contents as quickly as a pail of coal could be emptied into the magazine of a stove. Some of these machines can be operated by three men, and yet have a capacity of 500 tons per hour. A large and modern coal vessel will carry a coal cargo of 6,000 tons. More than 2,500,000 tons of coal have gone to the head of the Great Lakes in a single season.

Historically considered, coal mining perhaps dates back to about the end of the 12th century. Coal, as an inflammable substance, appears to have been known to the ancients, and to the Britons before the Romans visited their island, it being found frequently in ravines and beds of rivers of a color and texture so decidedly different from the strata which in general accompany it; but as at that period, and for centuries afterward, the country was covered with immense forests, which supplied abundance of fuel for every purpose of life, there was no necessity for using coal as fuel. The working of coal, therefore, only became an object of attention as population and civilization advanced, when agriculture began to be studied, the woods cleared away and the arts of civil life cultivated; accordingly we find that the working of coal in Great Britain, as an article of commerce, is comparatively of modern date. The first charter giving liberty to the town of Newcastle-upon-Tyne to dig coal was granted by Henry III in 1239; it was then denominated «sea-coal,» on account of its being shipped for places at a distance. In the year 1281 the Newcastle coal-trade had become so extensive and important that laws were enacted for its regulation. In Scotland coal began to be worked much about the same time; and a charter was granted in the year 1291 in favor of the abbot and convent of Dunfermline, in the county of Fife, giving the right of digging coal in the lands of Pittencrieff, adjoining the convent. Coal began to be used for iron-smelting about the beginning of the 17th century. The working of coal gradually increased, though on a very limited scale, until the beginning of the 18th century, when the steam-engine was brought forward by Newcomen in the year 1705, and was applied to collieries in the vicinity of Newcastle about the year 1715. This machine produced a new era in the mining concerns of Great Britain, and, as it were in an instant, put every coal-field within the grasp of its owner. Collieries were opened in every quarter; and the coal-trade rapidly increased to an astonishing extent. This extension of the trade was greatly aided by James Watt, who so very much improved the construction and power of the steam-engine as to render it one of the most complete and most useful pieces of mechanism. See COAL MINING MACHINERY.

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RICHARD FERRIS,
Editorial Staff of The Americana.

COAL MINING MACHINERY. During the past 50 years numerous machines have been introduced for mining coal. In the United States coal mining by machinery has proved most successful and divides the field with drilling and blasting. 56 per cent of the coal product of the United States is now machine mined. In Europe, where coal mining by machines had its origin, the development has been slower. In Great Britain less than 10 per cent of the coal output is mined by machines. In the United States the practice has been to adapt the machines to the methods of mining in use, while abroad the attempt is often made to modify the mining methods to suit a particular type of machine. To obtain the best results methods and machines must be so planned and so operated as to secure the maximum of efficiency. The installation of mining machines, with the necessary plant for the production and transmission of power, requires large capital expenditure, with operating, maintenance and depreciation charges, and therefore machines should be kept steadily at work. A loss of 25 per cent of machine time means that one-fourth of the invested capital is idle and earning no profit to meet the fixed charges. It is particularly important to increase the length of the working faces, and to reduce the distance between the different places to be worked by the same machine, in order to increase the time that the machine is working without interruption, and to reduce the idle time when the machine is moved from one place to another. The machines should not be permitted to stand idle when ready for work, which means that the operations of timbering, track shifting, breaking down and loading of the coal, and especially the movement of the loaded and empty coal cars, must be so organized and systematized as to keep the mining machines at work. Incidentally such organization of the mine work reduces the cost of these auxiliary operations and increases the output.

The advantages which have led to the large use of coal mining machines are in part direct saving of cost, and in part indirect increase of profits. The direct savings are often small, the indirect gains are sometimes large. The direct saving of labor cost is largely offset by increased wages paid to the machine miners and to their helpers. Machine mined coal contains less slack or fine coal than that mined by powder, and the coal sells at a higher average price. Machine mining lessens the amount of powder used, a comparatively small saving, but lessens the chance of fire-damp and coal dust explosions, avoiding destruction of life and property, a very great gain. Machine mining increases the output both directly and indirectly, and thus increases the earnings on the invested capital, and repays that capital in a shorter term of years.

Coal-mining machines are operated by compressed air or by electricity. Electric power is much more efficient on account of the smaller power losses in generation and transmission. Compressed air is safer and should be used in mines in which there is danger of fire-damp explosions. By the use of explosion proof motors, storage battery locomotives and carefully insulated transmission lines, the employment of electricity is made more safe and by effective ventilation of the mine workings the chance of fire-damp explosions is reduced. The tendency to-day is toward increased use of electric power.

Coal mining machines are of five types: (1) Rotary boring machines; (2) rotary bar cutters; (3) rotary disc machines; (4) endless chain machines; (5) puncher machines. They are also divided according to their special application or their method of operation into: (1) Heading machines; (2) breast machines; (3) short wall machines; (4) long wall machines; (5) centre cut machines; (6) shearing machines; (7) loading machines; (8) combined cutting and loading machines; (9) conveyors.

Rotary boring machines are chiefly used for boring blast holes in coal or in the softer rocks. They have been used for boring air-ways of small diameter and for boring entries.

The rotary machines for boring blast holes are known as coal augers and are made in many forms, driven by hand, compressed air, or electricity, and mounted on bars, columns or other forms of support, or simply held in place by hand.

Figure 1 is an auger drill operated by compressed air. The machine itself weighs but 24 pounds and requires 18 cubic feet of free air per minute at 80 pounds pressure. Where the coal is soft it may be operated as a breast drill. For harder coal or soft rock it should be provided with a feed screw and column support. These small power drills are also made to be driven by electricity, direct or alternating current, and of different sizes and weights, from 24 pounds to 125 pounds for the machine alone and from one-half to three horse power. These auger drills are not adapted for use in very hard rock but can be used in bituminous coal, anthracite, rock salt, gypsum, fire clay, shale, slate and similar rocks of medium hardness. In such material they will bore from one to eight feet per minute.

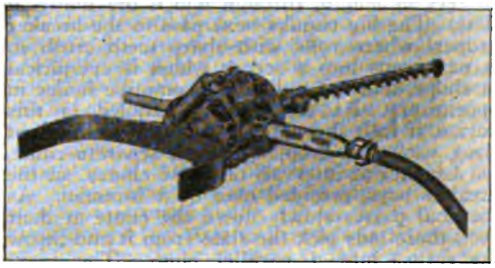
FIG. 1

Figure 2 is a one and one-half horse power electric auger drill mounted on a column, with a differential feed screw, by which the rate of boring can be adjusted to the hardness of the rock.

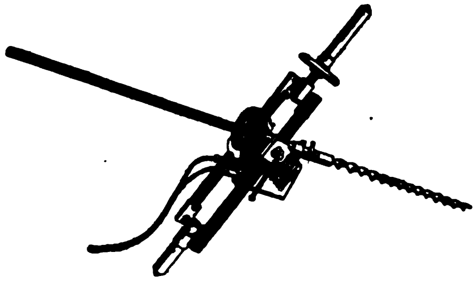
FIG. 2

Figure 3 shows example of the cutting edges of these auger bits; (a) and (b) are the shapes usually employed; (c) is effective in soft material, and (d) is one of the forms used for larger holes four or five inches in diameter. For boring deep holes in contracted workings, the twisted rods are made in sections of convenient lengths with socket joints.

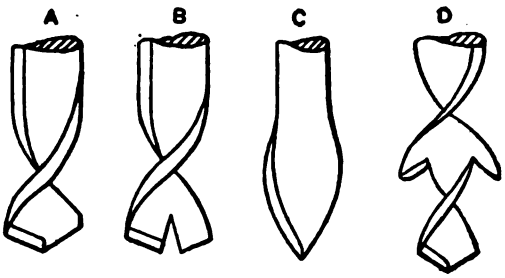

FIG. 3

Air hammer drills, with automatic rotation, and twisted cruciform drill steel with cross-bits, have been successfully used for boring blast holes in anthracite coal. These drills are more effective than augers in anthracite and can be used in hard rock. The twisted steel acts as a twist auger for discharging the cuttings from the hole.

The puncher machines (Figs. 4 and 5) are used instead of a pick for cutting coal. They are designed like machine drills, the cutting tool being fastened to the end of a piston rod driven at high speed by compressed air. Puncher machines are also driven indirectly by electric power, which is used to compress the air, either in a portable compressor which is brought into the working place, or the air is compressed in the cylinder of the puncher machine itself. The first plan has been more successful.

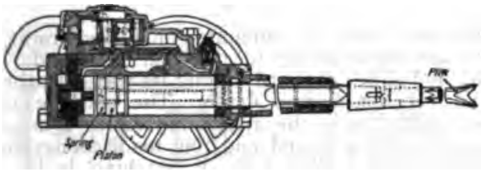

FIG. 4

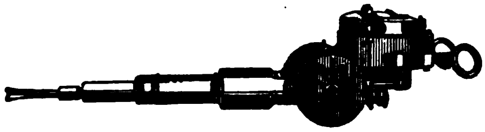

FIG. 5

Coal punchers are practically machine tools and possess great adaptability for work under difficult conditions. About 40 per cent of the coal mining machines now in use in this country are of this type. Disc and chain machines are less flexible and can be used only under conditions that are favorable. Disc and chain machines are generally used for undercutting only, that is, for cutting a kerf or deep grove under the coal so that the mass of coal above can be brought down by wedges or by a few blast holes.

Puncher machines, like the other coal cutters, are used for under-cutting the coal, but they are also used for shearing the undermined block of coal, that is, for cutting a vertical kerf or deep channel in the middle of a long block, or at both ends of a small block of undermined coal. Puncher machines are also to be preferred in hard or slaty coal, or where hard lumps of iron pyrite occur in the seam. Puncher machines are especially well adapted to narrow work, that is the driving of entries or narrow rooms.

Puncher machines for undercutting are mounted on wheels, as in Fig. 5. For shearing, wheels of larger diameter are used. A better method is to mount the machine on a column, with an arc and pinion support operated by a crank by which the puncher can be swung from side to side for undercutting, or up and down for shearing. In England and on the Continent puncher machines are frequently mounted on cars. A heading machine for driving entries has been perfected.* It consists of a large puncher machine mounted on a heavy frame capable of horizontal and vertical swing so as to command the whole face of the entry. A conveyor and car loader disposes of the coal as it is mined. The rate of advance in an average entry is said to be 10 feet per shift of eight hours.

The cutting bits used with the puncher machines have three to seven points, either forged from a single piece of steel or inserted in a head. The points have chisel or fish-tail edges. (See Fig. 6).

Disc coal cutters operate like a circular saw. They are used chiefly for undercutting long faces of coal or in long-wall work. Disc machines are not often used in this country, but are much favored abroad. The disc is armed with cutting chisels, which are replaced when dull, often twice or three times per shift. The disc is mounted on a flat arm, and is driven by a gear-wheel which engages in radial teeth inside of the cutting edge. This construction permits the disc to enter the coal nearly its full diameter. The cutting wheels are sometimes arranged to be tilted so as to follow irregularities or avoid obstacles. Either compressed air or electric motors may be used. The machines are heavy, weighing one to two tons, and are usually run on a track laid along the face, which also acts as a guide to resist the tendency of the machine to swing out of line from the action of the cutter wheel. Sometimes the machine slides on the floor without rails, and is guided between the face of the coal and the first row of props. The machine is pulled forward by a wire rope anchored at one end and attached to a windlass on the machine.

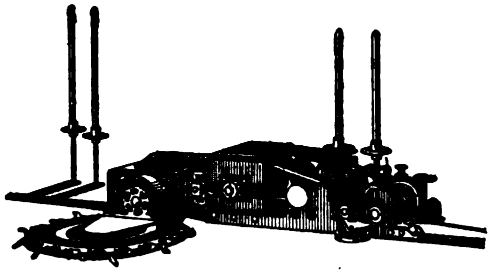

FIG. 6

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*Ingersoll-Rand Heading Machine.

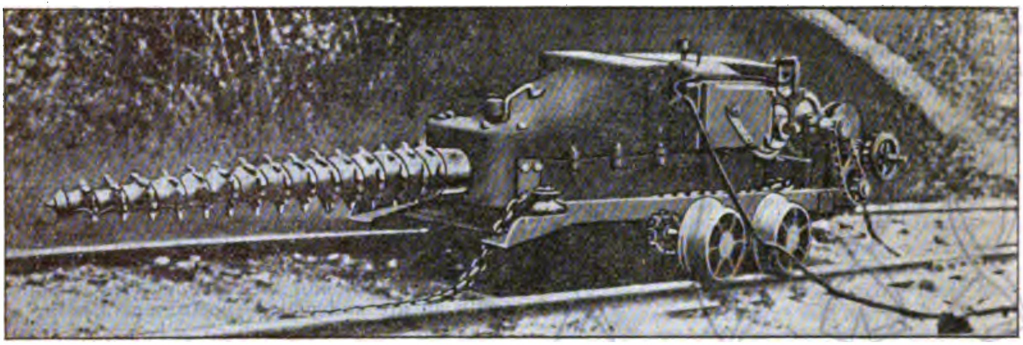

FIG. 7

The machines require from 15 to 30 horse power and average 8 to 12 square yards of undercut per hour, 3 to 7 feet deep. The kerf is 3½ to 5½ inches high and 3 feet to 5½ feet deep and is frequently made in the underclay. The tendency seems to be toward the use of heavier and more powerful machines and to the use of motors permitting a heavy overload. At times disc machines may use as much as 50 to 100 horse power from friction on the disc or binding from the weight of the coal. The coal as it is undercut is supported at frequent intervals by sprags to prevent the cutting wheel from being caught and held by the premature settlement of the coal.

Bar cutters have been much improved in recent years, and are now powerful and efficient machines. While generally driven by electric motors, compressed air has been used. The cutter bar, from 5 to 8 feet long, is tapered from 3 inches to 7 inches in diameter and has spiral ribs which act as a screw conveyor to remove the cuttings. The bar revolves 300 to 400 times a minute and has a reciprocating motion of two inches. The steel cutting bits are pointed and are inserted at intervals in the spiral rib. Sometimes they are inserted in the hollow between the ribs when a narrow kerf is desired. The kerf in any case is wider than with a disc machine. Sometimes this may be an advantage. The machines weigh from one to two tons and have motors of from 18 to 26 horse power. In some of the English machines the bar can be raised and lowered while at work and can be swung through an arc of 180 degrees. The American machine* in Fig. 7 is a short-wall machine and is shown loaded on its truck for transportation. At work it slides on the floor and is moved about by its own windlass and chain. Bar machines have about the same capacity as disc machines, 5 to 15 square yards per hour. A bar machine permits close spragging and is not so likely to be caught by the weight of the coal as a disc machine, and will free itself with less expenditure of power. Bar machines follow irregularities and avoid obstacles in cutting, more readily than disc machines. They can be used for undercutting in narrow rooms or entries. Bar machines operate with less noise than any other type of coal cutters.

Chain machines practically divide the field with puncher machines in this country, with a tendency toward the adoption of the chain for new installations. In these machines the cutting bits are inserted in alternate links of an endless chain, which runs in guides on the cutter arm. As in other coal cutters, provision is made for easily replacing worn bits. In the breast chain machines the cutting takes place at the end of the cutter bar, in other types of chain machines at the side of the cutter bar. Fig. 8 is a chain breast machine. It is mounted on a fixed frame, at right angles to the face of coal to be undercut, and slides forward cutting its way into the coal for the desired depth. The machine is then withdrawn, the frame moved to a new position and a second undercut made alongside of the first. This type of machine is best adapted for narrow work in small rooms and entries, but even for this work is being superseded by the short-wall machine.

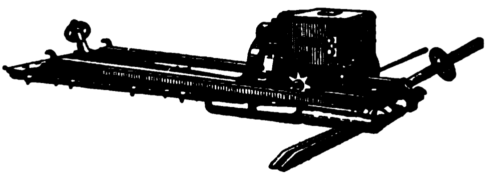

FIG. 8

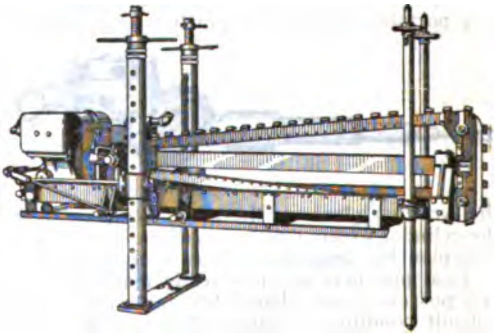

FIG. 9

Figure 9 is a chain breast machine as modified for a vertical or shearing cut. It is raised and lowered on the standard by its own power. A coal cutting and loading machine* has been developed which consists of a breast machine for undercutting, combined with two shearing machines and a battery of puncher machines. The machine is mounted on a carriage running on rails and is provided with an endless belt conveyor and car loader. This machine will cut and load into mine cars at one operation a block of coal 5 feet wide, 7 feet deep and the full height of the coal seam, up to 7 feet. It is said to have a capacity of 75 to 100 tons per eight hours. It can be used for driving entries 10 feet or less in width at the rate of 20 feet per shift of eight hours.

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* Not yet on the market.

* Jeffrey cutting and loading machine.

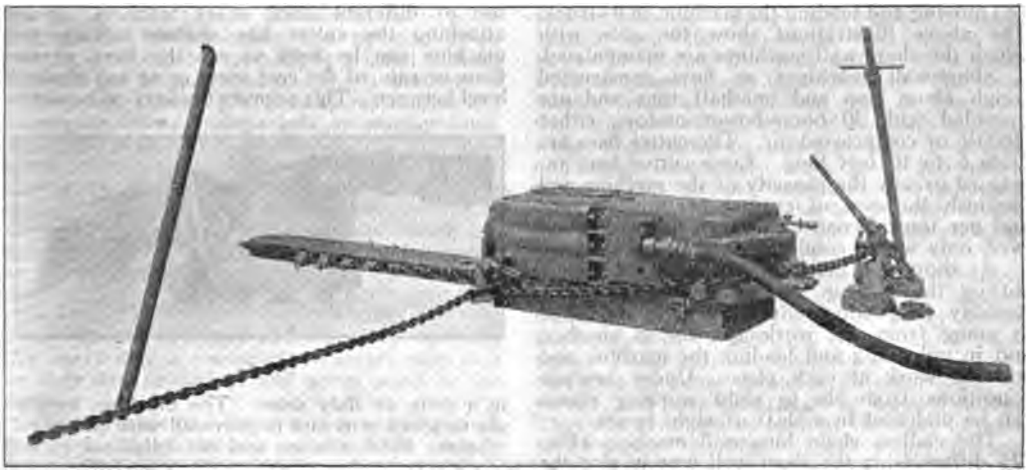
Fig. 10

The chain short-wall machine (Fig. 10) is an improvement of the breast machine, and is designed to avoid the labor and loss of time of the breast machine in withdrawing the coal cutter and shifting the frame at each cut. The short-wall machine, like the disc and bar machines, is designed for continuous work. The machine is provided with a winch or drum and slides and swings about on the floor of the working place by its own power. A separate power driven truck is used to move the machine from one working place to another. The loading and unloading of the machine is effected by its own winch.

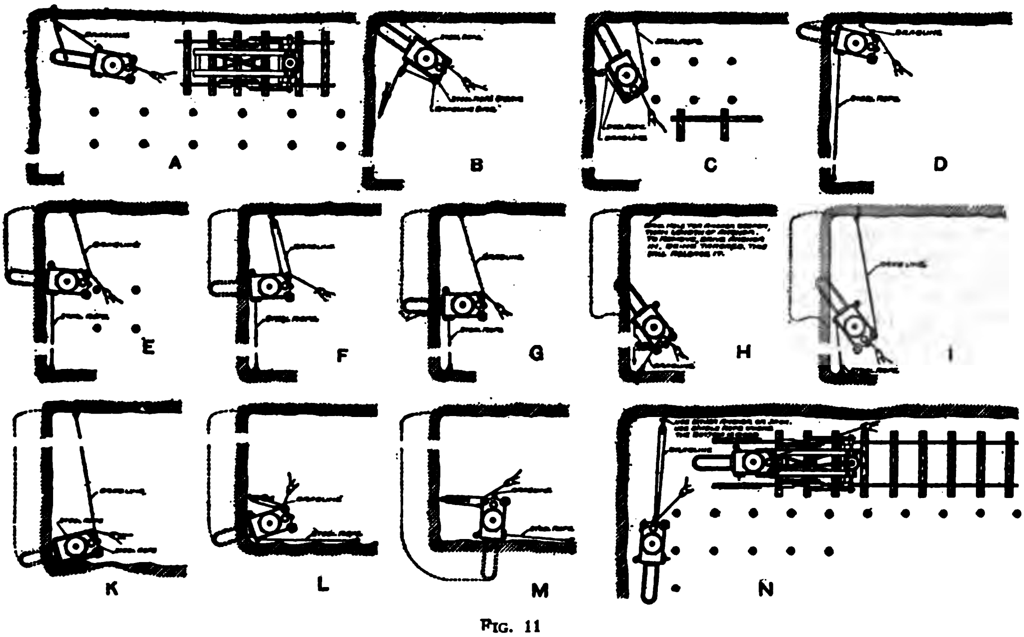

Fig. 11

The manner in which the short-wall machines are operated is shown in Fig. 11. At (a) the machine has been unloaded; (b) shows it in place for making the sumping cut; (c) is the position taken for the same purpose where the roof is bad and the props are set close to the face; at (d) the sumping is finished and the machine is ready to travel across the face; (e) shows the machine cutting across the face; (f) the cutter arm is advanced for hard cutting; (g) shows how the machine is manipulated where a nodule of hard pyrite is encountered; (h) the cutting arm is turned out to set the bits and (i) returned to continue the cut; (k) the undercutting is finished; (l) machine is ready to widen out a room; (m) cutting along the side; (n) moving and loading the machine on its truck. The above illustrations show the ease with which the short-wall machines are manipulated.

Short-wall machines as now constructed weigh about two and one-half tons and are provided with 30 horse-power motors, either electric or compressed air. The cutter bars are from 5 to 10 feet long. Long cutter bars increased greatly the capacity of the machine and diminish the cost of cutting per square yard and per ton of coal. They can be used, however, only where conditions are favorable.

As short-wall machines are used for undercutting the coal in entries and rooms, their capacity is greatly reduced by the time lost in going from one working place to another, and in unloading and loading the machine and starting work at each place. Under average conditions from six to eight working places can be undercut in a shift of eight hours.

The endless chain long-wall machine (Fig. 12) differs from the short-wall type in that the cutter bar is pivoted so that it can be swung through an arc of 180 degrees. In cutting the bar is at right angles to the machine. This permits the machine to travel in a narrower space, so that props can be set within three feet of the space. The short-wall machine requires a space of six or seven feet.

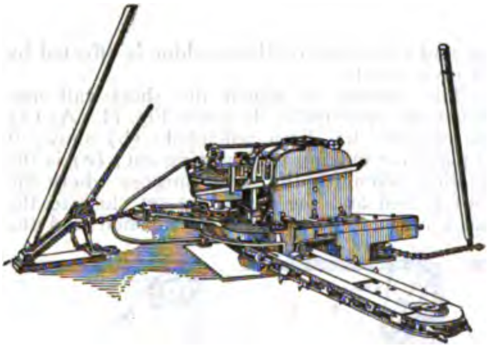

Fig. 12

The arc wall or turret type of chain machine (Fig. 13) represents the latest development in coal cutting machinery. It is mounted on a self-propelling truck, and is operated from the track without the delay of unloading. The cutter bar swings through a semi-circle and the machine is mounted on three standards and can be raised or lowered about one foot. By the use of different sized offset brackets, or by attaching the cutter bar without offset, the machine can be built to cut the kerf at the floor or roof of the coal seam or at any desired level between. This permits the kerf to be made in a dirty or slaty seam. The machine weighs six to seven tons and is provided with powerful motors. With a seven and one-half-foot cutter bar it commands a width of 20 feet. For rooms of greater width the track must be shifted or laid along the face. Two tracks may be used. It can be operated in an entry of ordinary width. The capacity of the machine is said to be about double the short-wall machine and three times that of the breast machine.

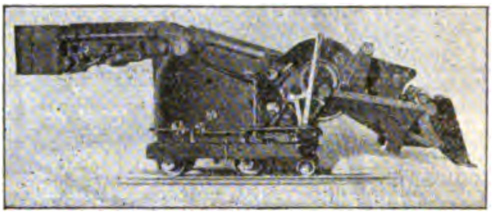

Fig 14

The loading of mine cars by hand is a slow operation. Fig. 14 shows a shoveling machine in successful use in the metal mines, which is now coming into use in the coal mines as well. These machines have a loading capacity of one to two tons of coal per minute. They are built to work in coal seams as thin as four feet and can be used in narrow entries, rooms or long-wall workings. The machines weigh from 5 to 10 tons, and require 7½ to 12 horse power. They are driven by compressed air or electric power, and are generally equipped with motors 50 per cent above actual power requirements. The shovel should have sufficient lifting power to break up coal which has fallen in large blocks.

In long-wall mining the rapid loading of the coal from the long working face is difficult. The use of conveyors, extending along the face, to move the coal and load it on cars in the haulage entries greatly facilitates this work. Face conveyors are particularly useful in thin or inclined coal beds. These conveyors are of

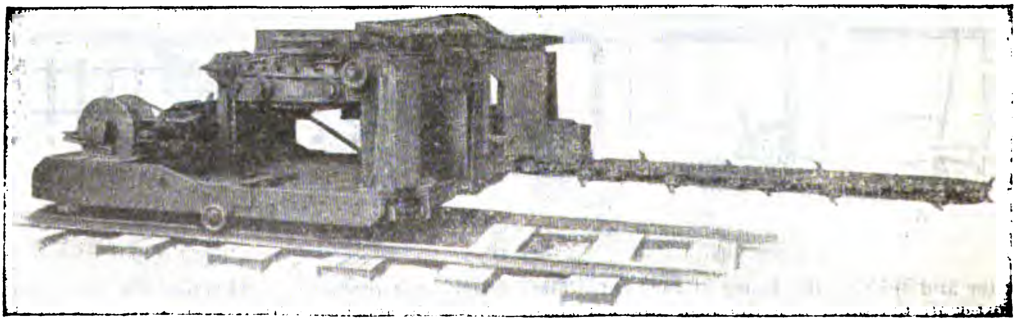

Fig. 13

three types: (1) Small cars run back and forth by mechanical means, singly or in trains. These can be used in thin coal beds and at any inclination, but do not provide for continuous loading. (2) Shaking troughs, used in inclined workings. The trough of sheet metal is given a combined reciprocating and up and down motion, and can be operated at a small inclination. The breakage of coal is sometimes a serious objection. (3) Continuous mechanical conveyors either endless belt or scraper lines. The endless belt type conveys the coal with minimum power and minimum breakage. These conveyors are loaded by hand or a shoveling machine may be used for the purpose. The remarks at the beginning of this article on the importance of keeping mining machines steadily at work by effective organization applies with especial force to loading and conveying machinery. The haulage system must be well designed and equipped and efficiently operated that there may be no failure to supply mine cars as they are needed at any given point in the mine.

Mine Haulage.—Up to a very recent period, the coal cut by the various machines already described has been hauled from the side headings or rooms to the shaft bottoms almost exclusively by mules, but they are being rapidly supplanted by improved systems of steam haulage in the anthracite coal regions, and electric haulage in the bituminous drift mines adopted to meet the demands of various conditions which necessitate haulage systems of greater speed and power than that afforded by the use of mules.

The solution of the problem of mine haulage, constantly increasing in complexity by the longer haulage consequent on the extension of the mines, and the demand for a larger output, requires the consideration of several important factors, such as the grades of the haulage roads, the height of the veins of coal and the expense of the installation and maintenance of the various forms of haulage machinery. Electricity as applied to mine haulage appears to satisfy these conditions better than any other form of power, and the development and extensive use of the electric mine locomotive is the natural result of the best efforts in this direction.

These locomotives are made in a great variety of forms and are equipped with single or double multipolar motors. They range in weight from 2½ to 15 tons, and are operated either by the more familiar overhead trolley wire, or the later third-rail systems. The latter consists of a stationary third rail of heavy iron bars running between the two track rails which are used as the return conductor. The bars of the third rail are perforated at regular intervals throughout their entire length, and are made into a continuous rail by means of fish plates. The locomotive consists of a substantial steel frame mounted on suitable track wheels. This frame also carries two steel sprocket or traction wheels, which are driven by the electric motors of the machine, by means of suitable gearing. These sprocket wheels engage the third rail through the perforations therein, and serve the double purpose of driving the locomotive along, and taking up the current from the third rail to feed the electric motor. The third rail is enclosed in an insulating wood casing, and is usually laid about five inches off the centre of the regular track, thus allowing sufficient room for the animals to work without interrupting the operation of the mine while the plant is being installed. The chief advantage of the system appears to be its positive working; the practicability of using light rails on heavy grades; and the minimum consumption of power in moving the dead weight of locomotives of comparatively light tonnage. The locomotives used at the present time in operating the «Morgan» electric third rail haulage systems range from 6,000 to 10,000 pounds in weight, and range in capacity from 75 to 150 horsepower. The smaller machines are equipped with single motors and the larger with double motors, wound for either 250 or 500 volts, as may be desired.

These locomotives as well as those operating the trolley systems are capable of hauling trains of 40 to 50 cars each, or about double the number of cars usually comprising a cable train. These cars are made in a great variety of forms to adapt them for different kinds of service, and have either steel or wooden bodies. They are arranged to open at the side, or with a «drop-gate» having «wings» which prevent the coal from spilling out at the ends of the gate when lowered. This gate also serves as an extension platform from which the coal may be conveniently shoveled.

Henry S. Munroe,
Mining Engineer, Washington, D. C.

COAL OIL, a volatile oil distilled from petroleum (q.v.).

COAL-TAR, or **GAS-TAR**, the opaque, viscid, black or brownish liquid arising as a by-product from the dry distillation of bituminous coal in the manufacture of coal gas, and also in the manufacture of coke. It consists principally of the substances grouped under the name of «aromatic hydrocarbons,» and varies in composition according to the grade of coal distilled, the degree of heat employed in the distillation, and the shape of the retorts used. In the lower temperatures at which coke is made (about 850° F.) the tar consists of photogen, paraffin oil, lubricating oils, paraffin, cresol and about 57 per cent of pitch; and the yield of tar may be as high as 20 gallons to the ton of coal. In the high temperatures employed in making coal gas (from 1650° to 1830° F.) the tar consists of benzene (benzol), toluene, naphthalene, anthracene, heavy oils, much creosote, and about 82 per cent of pitch; and the amount secured is about nine gallons per ton of coal. In the latter case many of the constituents of coke tar are broken up into permanent gases by the higher temperature. With horizontal retorts the yield of tar is about two gallons less per ton of coal than with vertical retorts.

The specific gravity of coal-tar ranges from 1.0 for low temperature tar to 1.2 for that produced at high temperatures.

Up to about the middle of the 19th century coal-tar was regarded as a waste product and thrown away, or burned under the retorts. About 1846 it began to be used in Germany for making roofing felt, and distillations of tar were used to impregnate railway sleepers. A year or two earlier, in England, coal-tar naphtha had been employed successfully as a solvent for India rubber. The discovery in

1856 of coal-tar colors caused a great demand for the crude substance, and it became a commercial product of increasing value.

Production and Uses.— The production of coal-tar in the United States in 1915 was 276,745,885 gallons of which 39,021,748 gallons (14 per cent) was used for fuel, and 237,724,137 gallons was sold into commerce. Of the total product 186,278,000 gallons came from old-style bench retorts and by-product coke ovens, and 51,446,344 gallons from gas plants. The aggregate value of the product was $6,656,276; an average value of 2.8 cents per gallon. The world's production in 1901 was reported at 2,660,440 tons: the United Kingdom producing 908,000 tons, Germany, 590,200 tons, and the United States, 272,400 tons. These three countries thus produced two-thirds of the whole. The principal uses now made of coal-tar are: as fuel — its heat value being nearly double that of coal; in preserving timber, stone and brick-work from the effects of moisture; in making roofing felt and roofing papers; as paint for metals; as a cement, in place of pitch; in the manufacture of lampblack and soot; as a top-dressing for roads; in the manufacture of dyes and medicines; in the production of solvents and explosives; and, to a limited degree, in gas manufacture — unprofitable at the prevailing value of coal-tar.

A considerable amount of the coal-tar marketed is artificially made by mixing coal-tar pitch with enough heavy oil (from petroleum) to give it the required fluidity at normal temperatures. (See also articles, COAL-TAR COLORS; COAL-TAR PRODUCTS). Consult Lewes, 'Carbonization of Coal' (1912); Lunge, 'Coal Tar and Ammonia' (1909); Wagner, 'Coal Gas Residuals' (1914); Warnes, 'Coal Tar Distillation' (1913).

COAL-TAR COLORS, the coloring matters or dyes artificially prepared from substances derived from coal tar. They are exceedingly numerous, and are mostly of complex chemical constitution, belonging to the group known as aromatic compounds (q.v.). They consist chemically of the natural element carbon in association with hydrogen, nitrogen, oxygen, sulphur and other elements. The coal-tar colors are of the greatest importance in the arts, and are used in enormous quantities in dyeing and calico-printing. In popular language they are often called aniline colors. This designation is inexact, however, for although they include the colors of the aniline class some of them are derivatives of phenol, anthracene and other substances. Some prejudice exists against the coal-tar colors in the public mind, because they are believed to be less permanent than the natural animal and vegetable colors, for which they are substituted. This criticism was quite justifiable some years ago, but a considerable number of coal-tar colors are now known which are fully as "fast" as the natural ones, and in some cases the coal-tar color has a decided advantage in this respect. The coal-tar color industry had its origin in England, where for 14 years it maintained pre-eminence, but the centre of the industry soon passed to Germany, then distilling enormous quantities of coal for other purposes. The first coal-tar dye was made by the English chemist Perkin in 1856. He called it "mauveine." In 1858 A. W. Hofmann published a paper in which he showed that magenta (aniline red) can be prepared by the action of carbon tetra-chloride upon aniline, and in 1859 Verguin first separated fuchsine, and manufactured magenta in quantity. During the next few years various other colors, notably aniline blue, were discovered and placed on the market, and aniline black was discovered by Lightfoot in 1863. The coal-tar color industry was greatly stimulated when Graebe and Liebermann effected the synthesis of alizarin from anthracene in 1868, thereby opening up a new and important field of chemical activity. Previous to this date alizarin was obtained from madder-root, but it is now almost exclusively manufactured from anthracene. Caro produced the first eosin dye in 1874. The synthesis of indigo was the result of a long series of investigations, the final step in which was taken by Baeyer in 1878; and in 1880 a German company placed on the market a substance known as nitrophenyl-propiolic acid, for depositing artificial indigo upon fibres by Baeyer's method. Other methods for the artificial manufacture of indigo have since been discovered, but the natural dye is still largely used.

The marks that are used in commerce for designating the shade of a color consist usually of certain letters affixed to the name of the color to be described. Thus R is used for red, O for orange, J or G for yellow (Fr. *jaune;* Ger. *Gelb*), B for blue and V for violet. Thus "Scarlet RR" or "Scarlet 2R" signifies a scarlet whose tint inclines toward red, and the doubled R signifies that an intermediate color is recognized, whose tint lies between that specified and the pure scarlet. Aniline blue occurs in a reddish shade which is designated as "aniline blue R"; while the finest quality of aniline blue is designated as "aniline blue 6B."

Much attention has been paid to the connection between the color of a substance and its chemical constitution. It is known that color depends on the structure of the molecule, but no absolute rule can be given for predicting the color of a compound whose formula is known. In the case of the aromatic series, however (which is of special interest to the student of coal-tar colors), the following may be said: All of the aromatic hydrocarbons are colorless (or white), and the same is true of such of their mono-substitution compounds as are obtained by replacing one atom of hydrogen with OH, NO_2 or NH_2. If two hydrogen atoms are replaced, the resulting compound is also colorless if the radicals introduced are alike. If they are unlike, and one of them is NO_2, then the resulting compound is colored. For example, benzene, C_6H_6, is colorless, and so also are its derivatives, aniline ($C_6H_5.NH_2$) and nitrobenzene ($C_6H_5.NO_2$), which are obtained by replacing one atom of hydrogen by NH_2 and NO_2, respectively. But if a second atom of hydrogen in the benzene nucleus of aniline be replaced by NO_2, we have the compound $NO_2.C_6H_4.NH_2$, which is known as nitroaniline and is yellow. The presence of certain atomic groups in the molecule of a substance appears to have a strong influence, also, upon the color of the compound. This is particularly noticeable in the quinones, which contain the group .O.O., and in the azo compounds, which contain the group .N:H. . The difference between a colored substance and a coloring matter, or dye, must be borne in mind, however. A dye is a substance which unites directly with the animal or vegetable fibres of the fabric to which it is applied, or with a mordant with which those fibres are impregnated. According to Witt's theory, a true dye must contain two species of molecular groups, one of which is called the chromophore («color-bearer»), while the other serves to make the compound acid or basic, so that it can form salts. The chromophores are very numerous. They have a distinct effect upon the color of the dyes formed with their aid. The groups NO_2, .N:N., and .O.O. are examples of chromophores. Compounds that contain chromophores but are neither acid nor basic are called chromogens («color-generators»). They are not dyes, but may be transformed into dyes by the introduction of a salt-forming group such as OH or NH_2. Azobenzene, $C_6H_5.N:N.C_6H_5$, is a colored substance, but it is not a dye. It is a chromogen, however, because it contains the chromophore-group .N:N.; and if one of its hydrogen atoms is replaced by the group OH, the compound $C_6H_5.N:N.C_6H_4.OH$, known as oxyazobenzene, is obtained, which is a true dye. Again if one of the atoms of hydrogen in azobenzene is replaced by NH_2, the compound $C_6H_5.N:N.C_6H_4.NH_2$ is obtained; this is also a true dye, and is known to chemists as amidoazobenzene. (Consult Hjelt, 'Principles of General Organic Chemistry,' from which these examples are taken). Coloring matters that are basic in nature are always used, in dyeing, in the form of salts; that is, it is the compounds of these substances with acids that are used, and not the free bases themselves. «Substantive» coloring matters are those that are directly absorbed from solution by the fibre to be dyed. «Adjective» coloring matters are those that are not directly absorbed in this manner, but which require the fibre to be first «mordanted,» or charged with certain metallic salts, or «animalized» with albumen, or treated in some other manner, before the dyeing can be done.

Of the 155 distinct chemical substances found in coal-tar, only nine are used in making coal-tar colors. These are benzol, toluol, xylol, phenol, napthalene, anthracene, methyl anthracene, phenanthrene and carbazol. Nearly all of the commercial coal-tar dyes are made from benzol, naphthalene and anthracene.

From the nine derivatives, or «crudes,» are made about 270 substances called «intermediates» which are not dyes, but from which the dyes are made. The latter numbered recently over 1,500, entirely distinct, and each requiring a separate process of manufacture. It is worthy of note in passing that the list of 270 intermediates does not by any means exhaust the possibilities of the nine coal-tar crudes. On the contrary, it is estimated that there are probably more than 2,000 of these intermediate substances, with millions of individual dyes yet to be discovered. In Germany alone upward of 8,000 patents have been granted for as many different coal-tar dyes and distinct processes of making them. Bülow calculated that theoretically 3,160,000 azo-dyes alone may be produced.

Classification.— Several different classifications of the coal-tar colors have been proposed, some from the chemist's standpoint, others from the dyer's point of view. The classification here given is according to Wahl, and is based upon the chromophore dominant in each group, the factor of greatest moment to the manufacturer of coal-tar dyestuffs.

I. Nitro-dyestuffs.
II. Nitroso-dyestuffs or quinone-oximes.
III. Azo-dyestuffs.
IV. Hydrazones.
V. Stilbene dyestuffs.
VI. Diphenylmethane dyestuffs.
VII. Triphenylmethane dyestuffs.
VIII. Xanthene dyestuffs.
IX. Acridine dyestuffs.
X. Anthracene dyestuffs.
XI. Quinone-imide dyestuffs (indamines, indophenols, oxazines, thiazines, azines).
XII. Indigo and indigoid dyestuffs.
XIII. Thiazol dyestuffs.
XIV. Sulphur dyestuffs.
XV. Aniline black.

Nitro-dyestuffs.— The dyes in this group contain the chromophore NO_2 which gives an acid character to the molecules of which it is a dominant constituent. This acid reaction is carefully preserved in making combinations to produce new colors. The majority of the nitro-dyes are derived from the phenols or naphthols, or their sulphonic acids.

As examples of this group may be mentioned picric acid, aurantia, martius yellow, victoria orange and naphthol yellow S. Picric acid was the first of the artificial dyestuffs, having been made in the 18th century by the action of nitric acid on hides, and aloes, and also on natural indigo. As its color (yellow) is not fast either to light or to washing, it is rarely used except in small admixtures with other dyes. Aurantia dyes wool and silk a shade of orange. It has been superseded by some of the azo-dyes. Martius yellow dyes wool and silk a bright yellow which fades with heat, and is not altogether fast as to washing. Victoria orange dyes wool and silk yellow; and napthol yellow S., also known as acid yellow, dyes wool and silk a brilliant yellow.

Nitroso-dyestuffs.— The nitrosophenols are obtained either by the action of nascent nitrous acid on phenol, or by the action of hydroxylamine on the quinones;— hence the alternate title quinone-oximes. Their dyeing properties depend on their combination with metallic mordants, the one most commonly used being ferric hydroxide, which yields intense shades of green. The most important dyes of this group are fast green or Russian green — an olive shade, gambin G and gambin R and naphthol green, all produced on an iron mordant.

Azo-dyestuffs.— This group is founded on the chromophore .N:N. An intermediate step is the production of diazo-compounds — by treating the salt of a primary aromatic amine with nascent nitrous acid. While these diazo-compounds are, for the most part, colorless, they combine with amines and phenols to form dyes of great intensity. Further, azo-dyestuffs containing an amido-group may be diazotised to yield another series containing two .N:N. chromophores: these are called diazo-compounds. Similarly other series are produced — trisazo-compounds, with three azo-chromophores, and tetrazo-compounds, with four azo-chromophores.

The production of azo-compounds requires, first, the diazotisation of the primary amine; second, the «coupling» of the diazo-compound thus formed with an amine or a phenol; third, the precipitation of the dyestuff from the solution.

In the process of diazotisation, the salt of an amine is converted into the corresponding salt of the diazo-compound by the action of nascent nitrous acid, produced by the decomposition of sodium nitrite with dilute hydrochloric acid. As diazo-compounds are decomposed by heat, the process is carried on at between 15° and 32° F.

In «coupling,» the substance to be combined with the diazo-compound is dissolved (in an alkaline solution if it is a phenol or a naphthol, or their sulphonic acids; in an acid or neutral solution if it is an amine), and the diazo-solution is added while the whole is stirred constantly.

The dyestuff rarely separates of itself, and is precipitated usually by the addition of common salt; in some cases by a mineral acid. The dyestuff solution is warmed and stirred vigorously while the salt is being added. The liquid is then treated in a filter press, and the cakes dried in a vacuum oven. The dye is finally ground to an impalpable powder, and «standardized» to a certain strength of color by the addition of salt, sodium sulphate, dextrine, etc.

The monoazo-dyes fall into two groups: the hydroxyazo-compounds, derived from a benzene hydrocarbon; and the amidoazo-compounds, derived from naphthalene. Of the first group, tropœolin O or resorcin yellow is an example: it dyes wool a reddish shade of yellow. Another example is chrysoïdine: it dyes wool and silk, and also cotton when mordanted with tannin, shades of orange. Of the second group, examples are found in azorubine S., azoeosin and the «Crocein» and «Ponceau» series, giving shades of yellow, orange and red on wool.

Of the mordant monoazo-dyes, examples are found in the diamond yellows, and, specifically of the chrome-mordanted dyes, diamond black.

Several of the insoluble salts of the monoazo-dyes are made into pigments: they are chiefly shades of red and purple.

Of the disazo-dyes, napthol blue-black and other blacks, Bismarck brown, Biebrich scarlet and Kongo red, are important examples. Through the coupling with tetrazo-compounds is obtained a large number of dyes with a wide range of color, notably the extensive series of diamine colors.

The trisazo-dyes are represented by benzo olive and benzo blue-black.

Hydrazones.— This group of colors is produced by the action of hydrazine or substituted hydrazines on aldehydes and ketones. The most important member of this group is tartrazine, which dyes wool an extremely fast brilliant yellow of a greenish hue. The flavazines, hydrazine yellows and xylene yellows belong to this group, as also does eriochrome red, which gives dull red shades to wool. These may be changed to bluish reds by after-chroming.

Stilbene Dyestuffs.— Stilbene or diphenylethylene is the source of several well-known dyes long in use. They arise from the treatment of *p*-nitrotoluene sulphonic acid, alone or in the presence of amido-compounds, with caustic soda. By varying the conditions as to temperature and dilution of the soda, various colors are obtained. As examples may be mentioned sun yellow or heliochrysin and direct yellow, which dye cotton directly shades of orange. Through the action of oxidizing agents, greener shades are obtained. Stilbene yellow and stilbene orange and the Mikado yellows belong to this group.

Diphenylmethane Dyestuffs.— Oxidation of diphenylmethane gives a ketone—benzophenone, and this, on reduction, yields a secondary alcohol — diphenylcarbinol or benzhydrol, which, on further reduction, gives diphenylmethane. These compounds are colorless: the dyes of this group are obtained from their amido-derivatives or alkylamido-derivatives which are capable of undergoing the cycle of reactions outlined. The dye of principal importance in this group is auramine. It is a basic dyestuff for wool, silk and cotton mordanted with tannin, and gives shades of yellow. A series of auramines is produced by varying the derivatives employed.

Triphenylmethane Dyestuffs.— From this hydrocarbon and its higher homologues are derived by oxidation a series of colorless substances known as carbinols. The dyestuffs of this division arise from the introduction of auxochromes into the carbinol molecule. There are two groups of these dyes: (1) The amido — or alkylamido — derivatives, in which the auxochromes are NH_2 and NR_2 groups; and (2) the hydroxy-derivatives in which the auxochromes are OH groups. The amido-derivatives include malachite green and its homologues — ethyl green, Guinea green, etc., and the magenta series. The hydroxy-derivatives include the aurines.

The extensive Magenta series includes the rosaniline group, represented by the aniline violets and methyl violet, and the pararosaniline group, represented by spirit blue, opal blue, etc. Among the aurines are benzaurine, an intense red, and eriochrome cyanine R, giving a brick red on wool. This may be changed to a violet-blue by after-chroming.

Xanthene Dyestuffs.— Xanthene upon oxidation yields the ketone xanthone, and this is convertible into xanthhydrol by reducing agents. To obtain dyestuffs it is necessary to introduce auxochromes in the *p*-position to the carbon atom of the methane residue in xanthene, and to oxidize the leuco-bases thus produced. To this group belong the Pyronines — dyes containing the pyrone «ring.» They dye silk and tannin-mordanted cotton shades of pink. The phthaleïns, represented by the eosines and erythrosines and rhodamines, including the violamines, anisolines and succineïns, belong in this group.

Acridine Dyestuffs.— Closely similar to xanthene is hydroacridine, the oxygen atom in the former being replaced in the latter by the divalent NH group. Upon being oxidized, hydroacridine yields acridine, a basic yellow substance which forms fluorescent solutions. Two forms of acridine are recognized: the symmetrical, springing from combinations with amines, and the asymmetrical, from combinations with diamines. The commercial dyes of this class are generally hydrochlorides. The principal dyes in this class are acridine yellow, dyeing tanned cotton a shade of yellow; benzoflavine, which gives yellow shades on wool, silk and tanned cotton; and chrysaniline, a component of the dye phosphine, used in dyeing leather and printing cotton goods.

Anthracene Dyestuffs.— Oxidized with chromic acid, anthracene yields the important chromogen anthraquinone. From this, dyestuffs are obtained by introducing OH, NH_2, NR_2 etc., groups in suitable positions. The anthraquinone dyestuffs are classified as (1) oxyanthraquinones; (2) amidoanthraquinones; and (3) those which contain also another chromogen besides anthraquinone.

The oxyanthraquinones dissolve in alkalis to form violet or blue solutions. Their value as dyes depends on the fact that they form insoluble lakes with metallic hydroxides. The most important members of the group are alizarin and purpurin, both of which are formed naturally in the root of the madder plant. Alizarin gives shades of bluish-red to violet and brown, with different mordants. Purpurin gives shades of scarlet on an alumina mordant. Anthracene blue is another important dye in this group; with chrome-mordanted material it gives a shade of blue.

The amidoanthraquinone and hydroxyamidoanthraquinone dyestuffs produce very bright shades which are fast as to light. The most important are those which contain one or two NHR groups, where R represents a sulphonated aromatic nucleus. In the amido-group are alizarin cyanine green, anthraquinone violet, and alizarin astrol: in the hydroxyamido-group, alizarin saphirol, alizarin celestol and alizarin irisol.

Among the dyestuffs arising from the combination of other chromogens with anthraquinone, characteristic examples are alizarin blue, alizarin green S and alizarin indigo blue.

An important group of dyes of the anthracene class are the so-called anthraquinone vat dyestuffs. They are insoluble in water, but give soluble products on reductions and have a decided affinity for textile fibres. These vat dyes are complex compounds of high molecular weight, containing nitrogen, sulphur and other groups in addition to the ketone groups of anthraquinone. They are classified as indanthrenes (a title now used for all the anthraquinone vat dyes), in shades of blue, gray and maroon; flavanthrenes, or indanthrene yellow, also orange and scarlet; benzanthrones, including cyanthrene and violanthrene, indanthrene violet and indanthrene green; the anthraquinoneimides, indanthrene red G and indanthrene bordeaux B; and the acylamidoanthraquinones, comprising the extensive series of the algol dyes — in shades of yellow, red, blue and violet. These vat dyes are used almost exclusively for the dyeing of cotton, but may be employed also for wool which has been treated with formaldehyde.

Quinone-Imide Dyestuffs.— This class includes the indamines and indophenols derived from *p*-quinone; and the oxazines, thiazines and azines derived from ortho-quinone.

The indamines are produced by oxidizing an equimolecular mixture of a *p*-diamine and a monamine in cold dilute solution. Phenylene blue, Bindschedler's green and toluylene blue are examples. The indamines are not used in dyeing because they hydrolyse in the presence of acids. They are used as raw material for making the oxazine, thiazine and azine dyes.

The indophenols are also sensitive to acids, and are used as raw material for making sulphur dyestuffs.

The thiazines contain a characteristic ring composed of nitrogen, carbon and sulphur. Lauth's violet is an example of the subdivision thiazimes, and methylene blue of the subdivision thiazones.

The oxazines differ from the thiazines only by the substitution of an oxygen atom for the characteristic sulphur atom of the latter. If the auxochromes introduced are amido- or alkyl-amido- groups, the resulting dyestuffs are oxazimes: if hydroxy-groups, they are oxyazones. Capri blue and Meldola's blue are examples of the first division, and resorufine and resazurine of the second.

The azine dyestuffs are all phenazonium derivatives. They are subdivided into eurhodines, eurhodoles, safranines, mauveïnes and indulines. The eurhodines are weak bases, of which the monoacid salts are red, and the diacid salts, green. The most important dye of this group is toluylene red. The eurhodoles are obtained by heating eurhodines with concentrated hydrochloric acid at 180°. The safranines are basic dyestuffs, which form three series of salts. The monoacid salts dye wool, silk and tanned cotton shades of red. The mauveïnes are phenyl-derivatives of the safranines. The group is now only of historic interest, mauveïne having been the first coal-tar color discovered. The indulines are considered phenylamido-derivatives of the mauveïnes. They are used in the printing of cotton fabrics. The gray dyestuffs known as nigrosines belong to this group.

Indigo and Indigoid Dyestuffs.— The production synthetically of indigotine (the coloring matter of the indigo plant) was accomplished in 1875 by the oxidation of indol by ozone. But it was not until 1890 that Heumann's synthesis with phenylglycine and its carboxylic acid afforded a profitable method of commercial manufacture. The sodamide modification of this process is the one now chiefly employed. Indirubine, a red dyestuff, is the isomer of indigotine, with which it occurs in the natural sources of indigo. It is synthesized by condensing isatin chloride with oxindol. Not used itself as a dye, its bromo-derivatives are valuable.

The indigoid dyestuffs are characterized by the presence of the indigo group, and are of two classes: symmetrical, obtained by oxidizing products similar to indoxyl; and asymmetrical, prepared by condensing a compound similar to indoxyl with a cyclic ketone, such as isatin. The principal commercial dyestuffs in this division are the thioindigo series of fast scarlets, reds and violet-reds used on cotton; and the substituted indigoid dyestuffs. The latter group includes the ciba dyes, polyhalogenated derivatives of the indigoid division and the Helindone series. The first are vat dyestuffs for wool, cotton and silk, in shades of yellow; the second, wool dyes of orange, scarlet, pink and red.

Thiazol Dyestuffs.— The thiazol ring is heterocyclic, containing three carbon atoms, one nitrogen atom and one sulphur atom. The first known derivative of this class was phenylbenzthiazol, obtained by fusing benzanilide with sulphur. The most important derivative is primuline, containing a free NH_2 group, which may be diazotised on the fibre and then combined with amines or phenols to give various shades. This class includes the so-called «Ingrain dyes,» which are fast to washing, but not fast to light. The colors are yellow, red, garnet and brown. Chlorophenine, thioflavine T and thiazol yellow belong to this class.

Sulphur Dyestuffs.— The sulphur or sulphide colors result from heating various organic substances with sulphur. They are direct dyes for vegetable fibres. Commercially, the sulphur dyes are known by many different names. They are nearly all colored powders, insoluble in water, acids and the other usual solvents, but soluble in cold alkalis in the presence of reducing agents. Two methods of preparing them are employed: the first is to treat substituted aromatic amines with chlordinitrobenzene; the second, to reduce indophenols or indamines. Several fine black dyes — vidal black, fast black, immedial black, etc.— blues, yellows and olives, maroon, browns and bronzes are found in this valuable class.

The sulphurized vat dyestuffs form a distinct division under the sulphur class. They are produced by the action of polysulphides on certain organic compounds, but they are insoluble in sodium sulphide. They are divided into (1) sulphurized anthracene derivatives, and (2) sulphurized vat dyestuffs of indophenols and allied compounds. The first are prepared by melting anthracene and some of its more complicated derivatives with sulphur at high temperatures. Indanthrene olive is a type of this class: it is obtained by melting anthracene with sulphur at 480° F. Other colors in this group are the cibarones — blue, black, green, yellow, orange and brown. The second division includes indocarbon and most of the hydron series — blue, blue-black and violet.

Aniline Black.— An insoluble dye obtained bv treating aniline with acid oxidizing agents. In its solid form it is not used in printing cotton fabrics, but is always developed on the fibre by special processes. Aniline black is perhaps the most important of all dyes for cotton fabrics. Depending for its color upon oxidation, it is thoroughly fast, and ungreenable. See COAL TAR; COAL-TAR PRODUCTS.

Bibliography.— Beacall, 'Dyestuffs and Coal-Tar Products' (1915); Cain and Thorpe, 'The Synthetic Dyestuffs' (1913); Fay, 'Coal-Tar Dyes' (1911); Green, 'Analysis of Dyestuffs' (1915); Lewes, 'The Carbonization of Coal' (1912); Wahl, 'Organic Dyestuffs' (1914); Warnes, 'Coal Tar Distillation' (1913).

RICHARD FERRIS,
Editorial Staff of The Americana.

COAL-TAR PRODUCTS. Coal-tar is separated into its many valuable constituents by distillation at gradually increasing temperatures. This is done usually in an iron still cylindrical in shape, about as high as it is in diameter, with a domed top and a concave bottom. The charge is usually 20 tons of tar, which has previously been completely freed from its water content. The distillate passes through a condensing coil surrounded with water which is cold at first but is changed at intervals to hot — to prevent blocking of the coil with solid substances which crystallize out.

The products of this primary distillation are (1) light oils of a specific gravity of 0.90 to 0.95, coming over up to the temperature of 342° F., and in amount varying from 2 to 8 per cent of the charge of tar; (2) middle, or carbolic oils of a specific gravity of 1.01, coming over above 342° and up to 446°, in amount, 8 to 10 per cent of the tar; (3) heavy, or creosote oils of a specific gravity of 1.04, coming over above 446° and up to 518°, in amount, 8 to 10 per cent of the tar; and (4) anthracene oils of a specific gravity of 1.10, coming over above 518° and up to·752°, in amount, 16 to 20 per cent of the tar. The residue in the still is pitch, in amount, about 50 per cent of the original charge of tar.

These primary distillation products are treated in various ways to secure the large variety of coal-tar products known to commerce and utilized in the economic arts.

The light oils are first redistilled, to separate them from a small admixture of the middle or carbolic oils. Then the purer liquid is agitated at a low temperature with concentrated sulphuric acid in cast iron or lead-lined wooden vessels. This operation fixes the bases, and the unsaturated hydrocarbons, phenols, and sulphur compounds are dissolved or resinified. The acid portion is drawn off and yields ammonia sulphate and pyridine. The oil is then washed with water and a weak solution of caustic soda, and, after drying, is fractionally distilled.

The fractions are collected in four portions: (1) the "first runnings," up to a temperature of 158° F.— consisting chiefly of carbon disulphide, pentane, hexane and aceto-nitrite; (2) light benzol, coming over above 158° and up to 252°; (3) heavy benzol, coming over above 252°, and up to 350°; and (4) carbolic oils, which are turned back into that portion of the primary products.

The "crude" benzol thus obtained is again distilled, and separated into pure benzol, toluol, xylol and a residue which is called "solvent naphtha." The pure benzol and toluol thus obtained yield coal-tar dyes. The 90 per cent benzol is used in making a motor fuel, in laundry work and in the manufacture of illuminating gas. Solvent naphtha is used extensively in the rubber industry.

The middle or carbolic oils contain naphthalene, phenol and the cresols. Naphthalene crystallizes out when the oil is allowed to stand, and the crystals are separated in a centrifugal machine and by pressure. After the naphthalene is removed, phenol to the amount of 30 to 40 per cent is obtained by fractional extraction with a 10 per cent caustic soda solution, and then neutralized by sulphuric or carbonic acid — which precipitates the phenol fluid. This, again, is fractionally distilled and subjected to cold, when the phenol crystallizes out, leaving the cresols still liquid. The pure phenol is used in making picric and salicylic acids. The cresols remain in three forms mingled together — ortho-cresol, para-cresol and meta-cresol — and are used in the crude form as a disinfectant.

The heavy or creosote oils are a combination of neutral and acid oils, chiefly: naphthalene, dinaphthalene, methylnapthalene, xylenol, naphthol and paraffins. The creosote oils are used principally for preserving timber.

The anthracene oils contain some carbolic acid besides the anthracene. The latter is separated out by chilling the oils to a temperature where the anthracene crystallizes into what is known as crude anthracene, from 10 to 12 per cent pure. The impurities consist chiefly of phenanthrene, methylanthracene, diphenyl, naphthalene, pyrene, cretene and carbazol. The crude anthracene is subjected to a pressure of 3,000 to

4,000 pounds to the square inch in a hydraulic press heated by steam. Nearly all the phenanthrene and naphthalene flow out in liquid form. The remainder is washed with solvent naphtha, and with the acid pyridine liquid from the first treatment of the oils, and anthracene of 90 per cent purity remains.

Anthracene, when oxidized, yields anthraquinone, from which is obtained alizarine, and thence the whole large group of alizarine dyes. The fluid remaining after washing the light oils with sulphuric acid contains pyridine, and the other bases — the picolines, lutidines, etc. Ammonia gas is run into the liquid until the pyridine separates — as an oil. Quinoline is separated in the same way from the sulphuric acid washing of the heavy oils. It is used in making indigo.

These secondary products yield, besides the coal-tar colors, an extended list of medicinal drugs, perfumes, flavorings, disinfectants and preservatives, burning and lubricating oils, pigments, photographic chemicals, etc. Only a few of these can be mentioned here.

From benzol are derived nitrobenzene, yielding aniline and thence the aniline colors; erythrosine, used to render photographic plates orthochromatic; fluorescine, used in testing the purity of drinking waters; the flavoring "bitter almond oil," and a similar perfume; acetanilide, the basis of headache powders; and the hypnotic, acetophenone.

From toluol are derived the preservative benzoic acid, and its salts; picric acid, trinitrotoluol and other high explosives; the benzaldehydes, and others; and the drug saccharine, 300 times sweeter than sugar.

From phenol come nitrophenol, and the amidophenol dyes; coumarin, the artificial vanilla flavoring; carbolic acid, the surgeon's sterilizer; and salicylic acid and its medicinal salts.

Xylol is the source of xylidine scarlet and other dyes.

Naphthalene yields naphthol and amidonaphthol dyes; is vaporized to enrich and add to the brilliancy of coal-gas; and is burned to produce a high grade of lamp black.

From quinoline come antipyrine and other antipyretic medicines, and the photographic developers, hydroquinone, eikonogen, etc.

The pitch which forms 50 per cent of the bulk of coal-tar is the base of many waterproofing and paving materials, and the source of most artificial asphalt.

Production.— When the European War broke out in August 1914, there were in the United States six factories making coal-tar colors. They employed about 400 operatives, and manufactured annually about 3,300 short tons of coal-tar dyes. The consumption in the United States was about 29,000 short tons, of which 22,000 tons came from Germany. At the close of 1915, there were 14 concerns making finished dyestuffs in the United States, and a score or more making intermediates. Several of the larger textile mills also have established dye-making plants of their own. The aggregate production for 1915 was about 15,000 tons, with a much larger output in sight for 1916. See CHEMISTRY, PROGRESS OF.

Bibliography.— Beacall, 'Dyestuffs and Coal Tar Products' (1915); Gardner, 'The British Coal Tar Industry' (1915); Lewes, 'The Carbonization of Coal' (1912); Lunge, 'Coal Tar and Ammonia' (1900); Wagner, 'Coal Gas Residuals' (1914); Warnes, 'Coal Tar Distillation' (1913).

RICHARD FERRIS,
Editorial Staff of The Americana.

COAL WASHING. Coal washing consists in the removal from coal of the impurities which it contains in nature. Some of these cannot be removed because they are part of the coal itself; for example, some of the ash, of the phosphorus and of the sulphur. Others, as slate, bone or impure coal, and pyrite, can be removed to a certain extent by washing, because they are mechanically mixed with the true coal. The need for washing lies in the fact that when the slate is removed a ton of coal has greater heating power and is worth more to the consumer, and when pyrite is removed the coal has less sulphur and it is more advantageous for making coke and from it iron and steel. Coke for the iron business should not contain over 1 per cent sulphur nor more than 6 to 10 per cent of ash.

Bituminous Coal.— The operation of washing bituminous coals consists of three steps: crushing, screening and washing. Of the many breakers the Bradford breaker has been much used. It consists (see Fig. 1) of a revolving cylinder with perforated walls for screening the coal and with longitudinal lifting plates which lift and drop the lump coal and thus break it. The hard lumps consist mainly of pyrite balls and slate and are sent direct to the dump as waste; the fine coal is then ready for the washer. Crushing rolls with inserted teeth (see Fig. 2) are used in many collieries for crushing

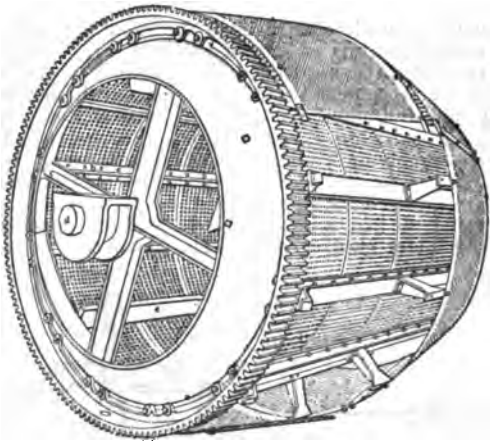

FIG. 1 — The Bradford Coal Breaker

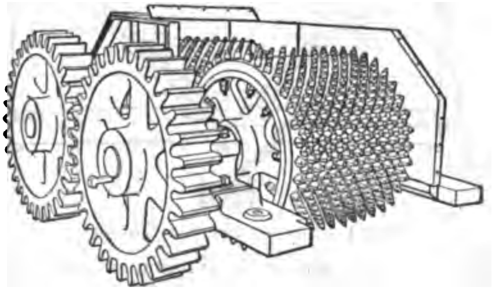

FIG. 2 — Toothed Rolls

the coal, the two rolls revolving toward one another break the coal which is fed in between them. The closer the rolls are set together and the finer the teeth, the smaller will the coal be broken.

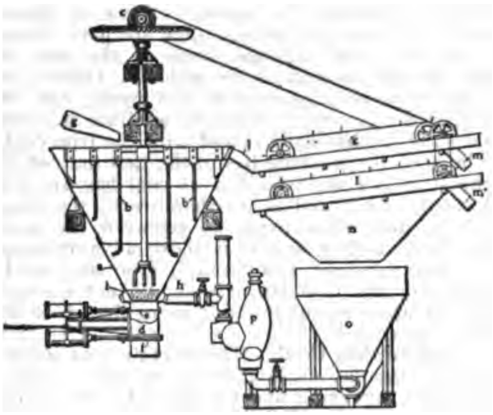

FIG. 3—Jeffrey-Robinson Washer

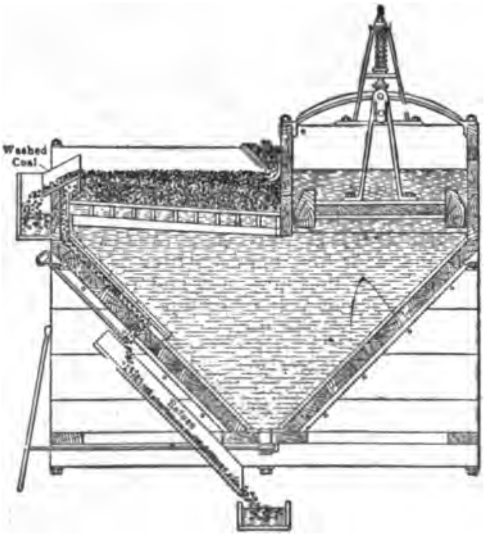

FIG. 4—New Century Nut-Coal Jig

The Jeffrey-Robinson coal washer (see Fig. 3) consists of a cone which is fixed and is fed with its crude coal through the spout, g; it has revolving arms and from the arms are vertical revolving stirring rods, b, b; a current of water rising through the coal is fed in from the pump, p, and the annular distributing pipe and screen, i. This rising current loosens the coal which the revolving rods still further stir, and the heavy slate and pyrite settle to the bottom and are drawn into the pocket, d, by the upper gate valve, e, and later are discharged by opening the lower gate valve, f. The clean coal overflows at the top at j, is scraped over the coarse screen, k, by the scraper conveyor and discharged at m; the fine coal which passes through k is scraped forward on the fine screen, l, by its scraper conveyer and discharged at m'; the fine clay and sludge pass through this fine screen and are separated from the water which is returned to do more washing. The New Century Nut Coal Jig (see Fig. 4) has a screen in a tank with two compartments, the screen occupies one compartment while a plunger occupies the other. As the plunger is pushed down it causes a rush of water up through the screen, the coal and heavy impurities resting on the screen are made liquid and mobile by the rising water, and the heavy particles quickly find their way to the bottom while the light pure coal rises to the top and overflows at the end and is saved; the heavy slate and pyrite are discharged under a gate and over a slight dam and are discharged as refuse beneath. The Pittsburgh jig (see Fig. 5) has no plunger to actuate the water, but it has its screen mounted in a large box and this box moves up and down in the water tank; as the box moves down the water rushes up through the intake valves and up through the perforated metal bottom or screen and liquifies the coal and slate, allowing the coal to rise to the top and the slate to settle to the bottom; the cleaned coal overflows and is carried off by a drag conveyor while the slate is let out from time to time by opening the slate gate. It goes to the bottom of the tank and is removed mechanically from there.

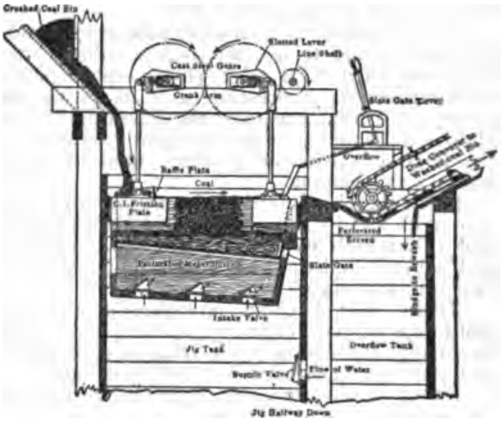

FIG. 5—The Pittsburgh Jig

For cleaning very fine coals, bumping washing-tables are used. The Campbell table (Fig. 6) is one of these; it is operated by what is called the cam spring and bumping post mechanism; the cam pushes the table down hill gently and is followed by the spring which pulls the table up hill more rapidly until it strikes the bumping post; at this instant all the particles on the table are jarred forward, the slate being heaviest is beneath, while the coal which is lightest is above; on the return stroke the water is acting to float this coal down hill. The end point is that the slate is all discharged at the upper end while the coal is discharged at the lower end. To do this the table is suspended on rods. The upper part of the table slopes slightly more than the lower part and the surface has thin cleats on it to prevent the slate from moving down hill.

A Robinson washery in Alabama is reported to treat 700 to 800 tons a day of which 40 per cent is shipped as lump and nut coal; the remainder, about 400 tons, is washed. A plant of this sort costs from $5,000 to $8,000; the cost of washing the coal for labor at washer is $2 per day; for labor at boilers, fuel, etc, $4; for repairs and supplies, $3. This figured for 400 tons would be 2¼ cents a ton. The water required is 35.1 gallons per ton of coal washed.

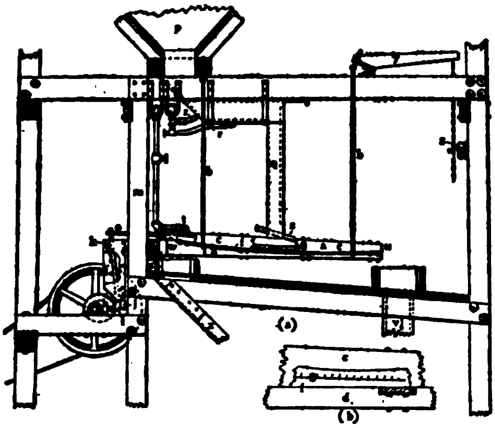

Fig. 6 — The Campbell Table

Anthracite coal comes from the mine in all sizes from large lumps down; the larger lumps must be broken and then the coal is screened into the commercial sizes known as steamboat, egg, stove, chestnut, pea, etc., and the slate, bone, dust, etc., are separated by hand picking and mechanical means.

Trade Sizes for Anthracite Coal.— The table shows the distance between the screen bars or the diameter of screen opening which determines the various sizes of anthracite coal as known to the trade.

Trade Name of Size	Size of opening in inches, over and through which the different sizes pass	
	Through	Over
Lump	..	6
Steamboat	6	4½
Broken or grate	4½	2¾
Egg	2¾	2
Stove	2	1⅜
Chestnut	1⅜	¾
Pea	¾	½
No. 1 buckwheat	½	5/16
No. 2 buckwheat	5/16	3/16
No. 3 buckwheat	3/16	3/32
Culm	3/32	..

It will be at once noticed that the market requires many more sizes of anthracite than of bituminous coal. This is because anthracite requires that its lumps shall be all nearly of the same size in order that they shall burn freely upon a grate. The anthracite breaker, as it is called, consists of a systematic grouping together of screens, rolls, where breaking is required, of picking chutes from which the boys pick the slate as the coal slides past them, and of shipping bins to which the different sizes are led and from which the coal is loaded into cars to be shipped by train to the market. Besides hand picking, several mechanical slate pickers have been devised which depend upon some physical feature of the slate, as for example, its tendency to come in thin, flat plates, while the coal is more cubical in form; they have the disadvantage that a thin, flat piece of coal ranks as slate and is lost. For the smaller sizes of anthracite the jigs have done very good work and are standard for cleaning those sizes. See Coal.

Robert H. Richards,
Massachusetts Institute of Technology, Author of 'Ore Dressing.'

COALDALE, Pa., borough in Schuylkill County, 15 miles north of Pottsville, on the Central of New Jersey and other railroads. It is a coal mining centre and seat of the Panther Valley Mining Institute. Pop. 5,154.

COALGATE, Okla., town and county-seat of Coal County, 120 miles southeast of Oklahoma, on the Chicago, Rock Island and Pacific and the Missouri, Kansas and Texas railroads. Coal mining and cotton raising are the chief industries. The waterworks are municipally owned. Pop. 3,255.

COALING STATIONS, depots established by maritime governments at various important points throughout the world, where the ships of the navy may obtain supplies of coal. The utility of such stations, when properly fortified, as points of refuge, defense and repair for warships in the event of war can hardly be overestimated. The more important of British stations are Aden, at Trincomalee (Ceylon), Singapore, Hongkong, Sierra Leone, Saint Helena, Mauritius, Jamaica and Simon's Town (Cape Colony). During 1898–1900 the United States established coaling stations for its navy at San Juan, Porto Rico; Pearl Harbor, Hawaii; Pago Pago, Samoa; Cavite, near Manila; at the chief port of Guam, Ladrone Islands; and at convenient points in Cuba; and coal «piles» at La Paz, Mexico, and at several points in Alaska. Some of the British coaling stations supply both naval and mercantile vessels.

COALINGA, Cal., city in Fresno County, 100 miles west of Fresno, on the Southern Pacific Railroad. It contains a Carnegie library and has a grammar school and a high school. It is in a very productive oil centre, there being about 1,300 producing wells in the district. The city has oil-field supply houses, a refinery and machine shops. Distilled water is supplied direct to the houses through pipe lines. Pop. 4,199.

COALITION, a combination of bodies or parts of a body into one body. In political history it means a temporary alliance or union for joint action of various powers or states; and especially of parties or members of parties. Several noted coalitions are (1) English: the joining of the Whig Party under Fox with the stronger faction of Lord North for the purpose of ousting the strongest body under Lord Shelburne; the coalition of the Whigs and the Peelites under Lord Aberdeen in 1852–53; and the Liberal Unionists and Conservatives in Lord Salisbury's third ministry in 1895. (2) American: the joining of the Henry Clay party in the United States Electorate with the J. Q. Adams faction for the defeat of the supporters of Andrew Jackson.

COALS TO NEWCASTLE. To carry coals to Newcastle means to do something that is superfluous. Newcastle being a great coal field, carrying coals there would be a type of unnecessary action. The French have a saying «to carry water to the river» for the same thing, and there are equivalents in almost every language.

COALVILLE, England, a town in Leicestershire, 15 miles north of Leicester. It is a coal-mining centre and has iron foundries, car shops and brick works. Pop. 18,548.

COALVILLE, Utah, city and county-seat of Summit County, 40 miles southeast of Ogden, on the Union Pacific Railroad, and on the Weber River. It has large stock raising and agricultural interests and coal mining is an important industry. The city owns the waterworks and electric lighting plants. Pop. 976.

COAMO, P. R., town on the Coamo River, 15 miles northeast of Ponce. It is celebrated for its mineral springs known as Baños de Coamo. The town is situated in a municipal district of the same name. Pop. (town) 4,000; municipal district, 12,000.

COAN, kō'an, **Titus,** American missionary: b. Keillingworth, Conn., 1 Feb. 1801; d. Hilo, Hawaii, 1 Dec. 1882. He was ordained as a Congregational minister in 1833 and in that year explored Patagonia, where his attempt to establish a mission was unsuccessful. In 1835 he went to the Hawaiian Islands, and for the remainder of his life was a missionary at Hilo, where he converted more than 14,000 natives and organized missions from Hawaii to the Marquesas and Gilbert Islands. The largest volcano in the world was in his parish and for 40 years he was its unwearied explorer and historian. He published many valuable papers dealing with the volcanoes of Hawaii and two books 'Adventures in Patagonia' (1880), and 'Life in Hawaii' (1881). The latter is considered a classic of missionary literature.

COAN, Titus Munson, American physician and author, son of Titus Coan (q.v.): b. Hilo, Hawaii, 27 Sept. 1836. He was educated at Williams College and at the College of Physicians and Surgeons of Columbia University. From 1861 to 1863 he served as an interne at Bellevue Hospital and in army hospitals. From 1863 to 1865 he served as assistant surgeon in Admiral Farragut's squadron. He now resides in New York where he founded in 1880 the New York Bureau of Literary Revision. His writings include 'Ounces of Prevention' (1885); 'Hawaiian Ethnography' (1899); 'The Natives of Hawaii: A Study of Polynesian Charm' (1901); 'Climate of Hawaii' (1901). He edited *Topics of the Time.*

COANZA. See KWANZA.

COAST ARTILLERY, a branch of the United States army entrusted with the defense of the coasts. For its function see COAST DEFENSE; for its organization see ARMY ORGANIZATION, and for its armament see ARTILLERY and GUNS. In 1918 a great part of the coast artillery was being used as heavy artillery in France.

COAST DEFENSE, systematic protection of a country against hostile attack along its coast-lines. The term should not be confused with Coast Defenses, which implies only those works erected at special points, for the defense of limited sections of the coast. In providing such defense a nation will consider not only the safety of its territory, but also the security of its commercial interests. In any system of coast defense a good navy is the most important feature; and so essential is it considered, that all other means are regarded as adjuncts or auxiliaries of the navy. Along a well-defended coast, in suitable places, are stations or points of support where is stored the requisite material for building, equipping, repairing and supplying naval vessels, and where provision is made for furnishing men when additional force is needed. Forts are built in places where the coast artillery may co-operate with the navy in obstructing the advance of an enemy intending to capture a city or to invade the country; where their guns may command the entrance to a harbor or other approach by water; wherever they may cripple the enemy's attack on the defensive fleet, leaving it free to attack the enemy in turn; where forts may assist each other and co-operate in repelling an invasion or preventing a blockade or a bombardment; where minor channels of approach may be closed or guarded, thus enabling the navy to give entire attention to the main channel, etc. Torpedo-boats, submarines, harbor-mines, the searchlight, which illuminates the harbor and permits detection of the enemy's manœuvres, and hydroplanes, are all valuable aids for the forts. The unfortified coast, as well as the land approaches to cities, must be defended in time of war by whatever means are at command.

The guns for coast defense change with the places and purposes for which they are to be used. To pierce the side armor of battleships, the flat trajectory, high-power guns are used; for projectiles intended to fall on the decks of an enemy's ships, the high-angle guns (mortars or howitzers) are employed. The number and size of guns vary with the estimated number and calibres of those which may be brought to bear by an enemy. From the depth and length of the channel may be determined how many and what classes of ships the enemy can operate in it, their armament, etc., and from these data the number and calibres of guns needed may be calculated.

The difficulty of obtaining naval supplies after war has been declared makes it necessary to store them during times of peace. Besides quantities of supplies at points of support for the navy, important harbors are generally equipped with torpedo storehouses, cable-tanks, mining casements, etc., for use in emergencies.

The tactics of coast defense have changed greatly since the beginning of the last decade of the 19th century. Besides defense against attack upon fortified places preparation is also necessary for resisting assaults upon unfortified coasts. The length of the United States coast-line makes its secure fortification a matter of great difficulty and expense.

Methods of reconnaissance are important for defense as well as for attack. The defense seeks to veil all batteries, and even in times of peace a journey along a fortified coast might not discover many forts or other means of defense. The enemy, in preparation for attack, or in action, seeks to discover the nature and strength of the defenses; and the defense in turn uses all possible methods of ascertaining the number and classes of the enemy's ships, the probable line of attack and whatever else may be discoverable in regard to his strength and purposes. Pictures of every important warship in the world are studied by certain officers of every navy and so close are some of these studies that a war vessel may be recognized by such an officer in any position in which he sees it. For the important work of reconnaissance, observation stations are fully equipped for the coast artillery, photographs, drawings, descriptions of warships, telescopes, etc., for use in procuring information of the enemy, being fully provided. One of the chief means of observation is the aeroplane or hydroplane.

In times of peace a country may, to its peril, neglect its coast defense, as was shown by the condition of the defenses of the United States at the beginning of the war with Spain. European nations have for years divided their tidewater regions into naval zones and have assigned to each zone reserves, torpedo divisions, lighthouse establishments, coast-guard services and signal stations.

In France the naval authority is made paramount and all naval affairs are in charge of the Minister of Marine, assisted by a chief of staff. Not only the mobile defenses, but the coast fortresses, submarine mines and the fort batteries are under control of the minister or his aide. In the United States the army and navy are jointly responsible in several grand divisions, under a chief of staff, with the Secretary of the Navy, as now, at the head of the department.

In recent times the navies of all leading countries have been enlarged, forts multiplied and strengthened, and more attention given to training young men in the tactics and strategy of defense, involving immense increase of national expenditure. In this general advance of naval preparation our own country is now maintaining a steady and quickened pace and questions of coast defense must here be solved with equal energy and intelligence. The work of providing a proper armament for the exposed harbors of the United States has been progressing as rapidly as the Congressional appropriations would permit. Since the outbreak of the war with Spain, and especially since the beginning of the European War, Congress has been more liberal with its provisions for pushing this work. According to the annual report of the United States Board of Ordnance and Fortification for 1895, at the rate of progress then being made, it would require 50 years of work to place the great stretch of seacoast in proper condition for defense. The board recommended an appropriation of $2,000,000 for engineer work in the construction of implements, fortifications, etc., and one of $5,000,000 for the construction of guns, mortars, gun-carriages, seacoast armament and ammunition. Concerning future advancement, the board recommended that it be along the following lines: the development of smokeless powders; the development of a high explosive that can be safely discharged in a shell at a high velocity with certainty of detonation; the development of rapid-fire field and seacoast guns and of an efficient system of fire control for harbor defenses. Recent reports show that satisfactory progress has been made in all these lines except that the use of armor-plates in forts has been abandoned for the more satisfactory earth and concrete emplacements.

By the beginning of 1915 all ports of commercial and strategic value along both coasts of the United States had been fortified, with the exception of the entrance to Chesapeake Bay. During the previous year five 14-inch guns were manufactured, to supersede some of the 12-inch guns, hitherto the heaviest of our coast artillery, but no longer adequate to match the modern 15-inch guns with which the larger battleships are being equipped. These latest 14-inch guns are designed to fire 1,660-pound projectiles with a maximum range of 18,000 yards.

It has been proposed by a committee of the Fortification Board to mount 16-inch, wire-wound guns at Cape Henry, throwing a projectile weighing 2,200 pounds. Mobile guns, of at least 12-inch calibre, mounted on special trucks that may be drawn along the railroad by locomotives, or along well-laid roads by huge motor cars, such as are being used by the Germans, were recommended for the defense of those sections of the coast not within the zone of protection of the permanent works.

The fortifications at both ends of the Panama Canal have been completed and the guns mounted; similar works are either completed or under construction in all the outlying possessions of the United States. On El Fraile Island, in Manila Bay, several 14-inch, wire-wound guns, each weighing 70 tons, are being mounted. The present policy of armament contemplates the emplacement of at least one 16-inch gun in the system of fortifications guarding every important harbor. The importance of these coast defenses may be realized from the fact that there is within range of modern gunfire, from 10 of our principal harbors, property to the value of over four and one-half billions of dollars. Up to 1912 approximately $125,000,000 had been spent or appropriated for coast defenses.

The army troops of the coast defense are classified with reference to their duties as follows: Coast artillery regulars, who man the guns as far as possible; coast artillery militia, who are required to man certain guns in order to complete the personnel lacking in regulars; coast artillery supports, whose function is local protection of fortifications against quick land raids from unprotected points; and the coast guard, which is composed of large bodies of infantry, cavalry and field artillery, prepared to oppose formal landings by the enemy.

The regular establishment of the coast defense at about the beginning of the European War was distributed as follows:

North Atlantic Coast Artillery District

	Companies		Companies
Portland	12	Narragansett Bay	12
Portsmouth	4	Long Island Sound	12
Boston	12	Eastern New York	6
New Bedford	8	Southern New York	14

South Atlantic Coast Artillery District

	Companies		Companies
The Delaware	4	Key West	1
Baltimore	3	Tampa	2
The Potomac	2	Pensacola	5
Chesapeake Bay	10	Mobile	2
Cape Fear	3	New Orleans	2
Charleston	3	Galveston	2
Savannah	4		

Pacific Coast Artillery District

	Companies		Companies
San Diego	2	The Columbia	4
San Francisco	17	Puget Sound	13

In Manila Bay there are 11 companies; in Hawaii 6, and in Panama 8. On 1 July 1914 the total force above enumerated amounted to 700 officers and 10,988 enlisted men.

The establishment of the coast artillery is 1,201 officers and 29,973 men by a bill passed by Congress in 1916. This force is practically sufficient to man all the necessary defenses. See Blockade; Bombardment; Fortification.

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COAST DEFENSE GUNS. See Guns, History and Development.

COAST AND GEODETIC SURVEY, United States. To all nations whose territory touches the sea or other water navigable to any extent, or who have any interests in the commerce of the sea, a full and complete knowledge of the coast — its nature and form, the character of the sea bottom near it, the location of reefs, shoals and other dangers to navigation, the direction and strength of currents and the character and amount of magnetic disturbance — is of the greatest moment. To supply this knowledge the governments of all maritime nations have in modern times executed surveys of their coasts by the most exact methods.

Some idea of the importance to this country of like operations and their extent may be formed when it is remembered that the coast line of the United States and Alaska, measured along its general trend, exceeds 10,000 miles in length. To represent the actual shore line as surveyed, which includes all the islands, bays, sounds and rivers in the littoral or tidal belt, these figures would have to be multiplied many times. To this must be added the shore line of Porto Rico, the Hawaiian Islands and the Philippine Islands. The length of the general shore line of only 14 of the principal islands of the latter group exceeds 11,000 miles.

On the recommendation of President Thomas Jefferson, Congress in 1807 authorized the establishment, as a bureau under the Secretary of the Treasury, of a national coast survey. For the purpose of furnishing geographic positions and other data to State surveys, the scope of the bureau was in 1878 enlarged and its designation became the United States Coast and Geodetic Survey. The superintendents of the survey have been F. R. Hassler (1816–18, 1832–43); A. D. Bache (1843–67); Benjamin Pierce (1867–74); Carlile P. Patterson (1874–81); Julius E. Hilgard (1881–85); Frank M. Thorn (1885–89); T. C. Mendenhall (1889–94); W. W. Duffield (1894–97); Henry L. Pritchett (1897–1900); O. H. Tittmann (1900–15); E. L. Jones (1915—).

The plan upon which it is organized is the outgrowth of trial and experience during the first 50 years of its existence and from its inception almost every year has seen some new feature added or some old one discarded. Under the direction of a superintendent there are two great divisions of its work. They are the field and the office. The field work includes all of the practical operations of the survey on land and sea. Except in time of war, in accordance with the plan of reorganization of 1843, the work upon the land was divided between civilian assistants and officers of the army, the hydrographic parties being in charge of naval officers. Since 1861 no officers of the army have been connected with the survey and the conduct of the hydrographic work was about equally divided between the civilian assistants and naval officers until 1898, when the naval officers were relieved, and since which time none have been assigned to the survey. The civilian assistants — now called hydrographic and geodetic engineers — and aides consist of a body of trained experts permanently attached to the survey and numbering about 152. The service owns a fleet of 15 steamers and one schooner, besides steam and motor launches. The office is that part of the establishment which receives the records, original sheets, etc., representing the results of field work. They are registered and deposited in the archives until in turn they are taken up for examination, computation and adjustment, prepared for publication and finally published. Original charts are reduced or enlarged, engraved, electrotyped and printed. For the convenience of administration the operations of the main office at Washington are carried on by eight divisions, each having some specified portion of the general work to perform. In these divisions are employed clerks, draftsmen, computers, engravers, instrument makers, printers, etc., numbering in all about 191. There are sub-offices at San Francisco, Seattle, New York, Galveston and Manila.

Many of the field operations of the survey being geodetic in their nature, a system of primary triangulation, together with the determination of geographic positions by means of astronomic methods, must furnish the foundation upon which the whole rests. On the Atlantic Coast a chain of triangles, beginning at the eastern boundary of Maine, stretches to the Gulf, constituting an oblique arc, which, besides serving as a basis for the coast triangulation, adds much to our knowledge of the figure of the earth. An extensive system of triangles extends across the continent along the 39th parallel of latitude, connecting the surveys of the two coasts and furnishing a basis for the surveys of the 13 States through which it passes. It is also one of the longest arcs now available for the determination of the figure of the earth. Another triangulation system is being executed along the 98th meridian. Its extension southward through Mexico has already begun and there is a prospect of its extension northward through the British possessions. Other important chains extend along the 112th meridian, the Canadian border and the Pacific Coast. In connection with these principal systems, the triangulation has been considerably expanded in the New England States, New York and several Western States, including California, where some exceptionally large figures were introduced. The longest line so far observed is from Mount Helena to Mount Shasta, over 190 miles.

A tertiary triangulation for topographic and hydrographic purposes has been completed along the entire Atlantic and Gulf coasts and over most of the Pacific Coast, including much of Alaska. Much progress has been made in the latter territory by methods which possess a sufficient degree of accuracy for immediate use and are capable of rapid execution. The coast of the Hawaiian Islands, of Porto Rico and of the greater part of the Canal Zone and the Philippine Islands has also been topographically surveyed.

In the determination of astronomic positions the exact methods originally developed in the survey have been adhered to and perfected. The methods of using the zenith telescope for latitude and the telegraph for longitude have been constantly improved.

The topographical operations have been mostly restricted to a narrow margin, not often over three to five miles wide, along the coast and surrounding harbors, bays and rivers up to the head of tide water. In some cases it has been somewhat more extensive, notably in the survey of the District of Columbia, where the scale was 1-4800 and the contour interval only five feet.

The hydrographic operations have extended as far out from the coast as was necessary for the interests of navigation and have included all harbors, channels, bays, etc., as far as the work has gone. Much work has been done in the investigation of submerged rocks by the wire drag. Deep-sea soundings have been made extensively, especially in and about the Gulf Stream. Much attention has been given to tides, and continuous series of tidal records have been obtained at several important points.

The results of the operations of the survey in connection with the study of terrestrial magnetism can be found on its charts and in its other numerous publications on the subject. In addition to the determination of the magnetic elements at many widely distributed points, and their frequent redetermination for secular variation, special observations are also made at certain base stations, with the aid of self-registering instruments, for the purpose of obtaining the record of the numerous variations of the earth's magnetism continually taking place.

The study of the force of gravity as a part of the great geodetic problem has received attention for 30 years and the survey has of late years developed methods and instruments which will lead to a great extension of the work at a less cost than by older processes, but without lowering the standard of accuracy.

A network of precise levels has been executed covering in a general way the United States, connecting the Atlantic Ocean, the Gulf of Mexico, the Great Lakes and the Pacific Ocean.

Throughout its history the survey has constantly been called upon to determine boundary lines, both State and national, which have been in dispute.

The office of standard weights and measures, charged with the maintenance of the standards of length, weight and capacity, which was under the direction of the superintendent of the Coast and Geodetic Survey until 30 June 1901, is now an independent organization under the title of the «National Bureau of Standards.»

The principal publications of the survey consist, among other things, of several hundred different charts; tide tables for all the principal and many minor ports; 'Coast Pilots,' containing minute sailing directions for all navigable waters along our coast; and the 'Report of the Coast and Geodetic Survey,' which contains, besides the reports of the superintendent and his assistants on the conduct of the work, a series of special reports upon various technical and scientific operations of the service. For details of the work of the bureau see CHART; COAST PILOTS; GEODESY; GRAVITY; HYDROGRAPHY; LEVELING; SURVEYING; TIDES.

COAST GUARD, a British force formerly under the Customs Department, but since 1856 under the Admiralty, and intended only to prevent smuggling, but now organized also for purposes of defense and governed by the Admiralty. The men, who are generally old men-of-war's men of good character, have high pay and are furnished with free cottages. The force numbers, with officers and men, about 3,000. In the United States the coast guard was formed by an act of Congress approved on 28 Jan. 1915 from the Revenue-Cutter Service and the Life-Saving Service (qq.v.), established respectively in 1790 and 1871. It is under the administration of the Secretary of the Treasury in times of peace, of the Secretary of the Navy in times of war. It takes care of the saving of life and property along the coast and at sea, the enforcement of maritime law, the prevention of smuggling, the removal of obstructions to navigation, etc. It is commanded by a captain commandant, ranking with a navy captain. The other coast guard officers are senior captains and the engineer-in-chief, ranking with commanders in the navy; and captains, first, second and third lieutenants of the line and of engineers, ranking with lieutenant-commander, lieutenant, senior grade, lieutenant, junior grade, and ensign, respectively. The establishment is: 1 captain-commandant; 6 senior captains; 31 captains; 37 first lieutenants; 94 second and third lieutenants; 1 engineer-in-chief; 6 captains of engineers; 28 first lieutenants of engineers; 51 second and third lieutenants of engineers; 2 constructors ranking as first lieutenants; 1 district superintendent ranking as captain; 3 district superintendents, ranking as first lieutenants; 4 district superintendents ranking as second lieutenants; 5 district superintendents ranking as third lieutenants.

These officers are trained at the Coast Guard Academy, at New London, Conn. The ranks of warrant officers are master's mate, keeper, boatswain, gunner, machinist and carpenter. Petty officers and men are enlisted for a year. The coast guard has about 268 shore stations.

COAST PILOTS, a book compiled to assist mariners in the navigation of their vessels, and, when from any cause they are without charts, to enable them to safely carry their vessels from port to port along the coast. The governments of all large maritime nations publish works for these purposes.

As early as 1796 a volume known as 'The American Coast Pilot,' by Capt. Lawrence Furlong, was published in Newburyport, Mass., by Edmund M. Blunt, and the first edition met with so ready a sale that a second edition of the same work was published in 1798. Since the latter date numerous compilers have published coast pilots of the coast of the United States and its harbors. These works were compiled from charts, from reports by shipmasters published in the newspapers, and from surveys and the personal knowledge of the compilers, some of whom were experienced shipmasters.

The vessels of the Coast and Geodetic Survey (q.v.), while engaged in surveying the coast and harbors of the United States, collected much information of importance to mariners which could not be shown on the charts or completely given in 'Notices to Mariners.' 'Coast Pilots' are published and distributed by the Coast and Geodetic Survey at the cost of the printing and binding. Similar information cannot be collected by private enterprise except at great cost and with imperfect means, and at the present time all the private publications containing such information relating to the coast of the United States are compilations from government publications and based generally on the work of the Coast and Geodetic Survey.

The compilation of the 'Coast Pilots' necessitates work in the office and in the field. The office work consists of the collection of the latest data from the reports and surveys of hydrographic and topographic parties, from the reports and surveys of the United States engineers engaged in the improvement of harbors and waterways, and from correspondence with local authorities and engineers. This information, in manuscript, is then put in the form of a volume which experience has shown to be convenient for the use of the mariner.

For the field work a vessel of the survey, with the compilers of the 'Coast Pilot' on board, visits every part of the coast which is treated in the volume; the information collected in the office is verified and, if necessary, corrected on the spot; the sailing lines and directions are tested by running over them; such artificial aids and natural landmarks as are of use to the mariner are noted and hydrographic examinations of reported dangers and changes are made; pilots, shipmasters and local authorities are interviewed and the latest information is incorporated, together with such notes as can only be obtained by observation and experience in the locality.

On returning to the office from the field work, this manuscript, correct to date, is prepared for the printer, and when printed the volumes are issued with a supplement or insertion sheet containing the changes which have occurred since the date of the preparation of the volume and while the matter was going through the press.

The 'Coast Pilots' published by the Coast and Geodetic Survey contain:

1. A tabular description of lighthouses, light vessels and fog signals; lists of life-saving stations, storm-warning display stations, and seacoast telegraph stations, and information regarding tides, tidal currents, variation of the compass, etc.

2. Nautical descriptions of the coast and harbors and general information concerning the several bodies of water and harbors, including notes relative to pilots, depth of water, draft of vessels entering the harbor, supplies, facilities for making repairs, usual or best anchorage and other matters of practical value. In each case the information of this nature precedes the sailing directions and is printed in smaller type.

3. Sailing directions, with subordinate paragraphs treating of prominent objects, dangers, aids to navigation, etc. The arrangement conforms to the order in which these matters would be considered in practice and be available when wanted promptly. For this purpose, and to afford a ready means of reference from one part to another, the sailing directions, where long, are divided into numbered or lettered paragraphs, printed in large type, each followed by its own subordinate remarks in smaller type.

4. Appendices, containing rules of the road at sea and in inland waters; laws and regulations relative to pilotage, harbor control, national and local quarantine, and Marine Hospital service; and information regarding storm-warning displays.

5. Views of important points. These are only inserted in volumes which treat of localities which have not yet been surveyed or where the lighthouses and other aids to navigation are not sufficiently numerous to readily locate and navigate a vessel.

6. Sections of charts covering the coast treated in the volume to aid in finding the geographic positions of different localities. Index maps showing the limits of the charts covering the localities treated in the volume.

The 'Coast Pilot' publications of the United States Coast and Geodetic Survey include:

Six volumes of the 'United States Coast Pilot, Atlantic Coast,' as follows:

Parts I–II. From Saint Croix River to Cape Ann.

Part III. From Cape Ann to Point Judith.

Part IV. From Point Judith to New York.

Section C. Sandy Hook to Cape Henry.

Section D. From Chesapeake Bay Entrance to Key West.

Section E. Gulf of Mexico, from Key West to the Rio Grande.

One volume of the 'Pacific Coast Pilot'; California, Oregon and Washington.

Two volumes of the 'Pacific Coast Pilot'; Alaska: Part I, Dixon Entrance to Yakutat Bay, with Inland Passage from Strait of Fuca to Dixon Entrance'; Part II, Yakutat Bay to Arctic Ocean.

'United States Coast Pilot'; West Indies, Porto Rico.

'Coast Pilot' Notes in Hawaiian Islands.

'Inside Route Pilot'; Coast of New Jersey; New York to Key West; Key West to New Orleans.

Six volumes of 'Sailing Directions'; Philippine Islands.

It is manifest that publications of this character must be subject to numerous corrections in the details after the lapse of a few years. To maintain the volume in a useful form corrections are issued in 'Notices to Mariners,' insertion sheets and supplements; and each volume is revised and passed to a new edition when the corrections have assumed proportions that impair its usefulness, or more recent surveys show changes or furnish additions that render the old volume untrustworthy.

COAST RANGE. The Pacific shore of the United States rises abruptly from the ocean along nearly its whole length, with practically no coastal plain of any size from southern California to the Strait of San Juan de Fuca. The hills and low mountains which border the ocean are given the general name of the Coast Range. They do not form, however, a continuous ridge but are rather parts of more or less disconnected uplifts, lower and possibly younger than the Sierra Nevada and Cascade ranges. North of the Strait of San Juan de Fuca the mountains of Vancouver Island and the Island Range of British Columbia mark the continuation of these uplifts, although in British Columbia the name of Coast Range is given to the mountains which border the continental shore and are spurs of the Cascades.

In California the Coast Range comprises two parallel ridges, 400 miles long, 30 to 60 miles apart and parallel to the coast from Point Concepcion in lat. 35° to Cape Mendocino, the ridge on the coast being the Coast Range proper and the inner the Monte Diablo range; the two separate the Sacramento and San Joaquin valleys from the Pacific. In the south the coast ranges and the Sierra Nevada coalesce and the topography is complicated by east and west ranges; thus opposite the Santa Barbara channel is the Santa Inez Range, having a height of about 4,000 feet, and farther south is another east-and-west range, the Santa Monica. Still farther south the uplift is much broken and irregular without strongly marked ridges but with portions rising into central dominating points like the San Bernardino and San Jacinto mountains, about 11,000 feet high.

North of lat. 35°, toward San Francisco Bay, there are no very high peaks. The highest peaks near the bay are Monte Diablo, 3,856 feet, an isolated peak that is a conspicuous landmark for miles; Mount Helena, 4,343 feet; and Mount Hamilton, 4,400 feet, the latter famous as the site of the great Lick Observatory. North of San Francisco Bay the heights of the summits gradually increase, and 150 miles north is Mount Bailey, 6,357 feet. Farther north the Coast Range becomes gradually a series of disconnected mountain groups, and near the Oregon line east-and-west ridges develop which unite with the Cascades, the most important of these being the Calapooia Mountains in Oregon.

Along the Oregon coast the uplift is low, being generally less than 3,000 feet. In Washington also the uplift is not great except in the Olympic Mountains between Puget Sound and the Pacific Ocean, which culminate in the fine peak of Mount Olympus, 8,150 feet.

Extending along such a length of coast, the coast ranges have a wide variety of climate and differ much in vegetation and attractiveness. In California, north of lat. 38° to San Francisco Bay, much of the outer range is covered with brush and has some timber. South, the mountains are covered with a thorny undergrowth known as chaparral. Near the coast, from Santa Barbara to San Francisco, there is a fair rainfall in the interior. The climate is very dry and the mountains are generally bare. North of San Francisco Bay the rainfall increases and the mountain valleys are fertile and picturesque. In Oregon the rainfall is heavy and in Washington very heavy; the mountains being covered with thick forests of fir, pine and spruce.

Geologically the mountains of the coast uplifts, besides being newer than the Sierra Nevada and Cascades, are also less broken through by granite than the Sierra Nevada, and less covered by lava than the Cascades. The upheaval began in late Tertiary time, and perhaps continued into the Quaternary, Pliocene rocks being upturned at a high angle near San Francisco Bay. South of San Francisco Bay the rocks are mostly of the Miocene series, though there are large areas of Cretaceous in the east side of the Monte Diablo belt. North of San Francisco Bay and in Oregon the proportion of Cretaceous increases and the Tertiary is much less. On Vancouver Island an uplift is believed to have taken place in Jurassic time.

Generally speaking, the rocks of the Coast Range in California are much metamorphosed, and large masses of serpentine and similar rocks are not uncommon. In places these serpentines sometimes contain workable deposits of chrome iron ore, though, owing to the limited demand, the production is small. The chief mineral wealth of the Coast Range is in quicksilver and petroleum, though some gold has been washed from placers in southern California. The quicksilver occurs at a number of places in the range where the altered rocks are silicified, and the total production, though the ore is generally of low grade, has been large.

South of San Francisco Bay, in the Miocene, in places is a great thickness of bituminous shale, there being several thousand feet of it near Santa Barbara and Los Angeles. This shale has been used extensively as a material for paving streets. Valuable oil-fields have been developed near Los Angeles. Little coal has been found in the range in California, and that is of poor quality. In Oregon is the Coos Bay field.

In Oregon and Washington the Coast Range contains very few mineral deposits of importance. On Vancouver Island, however, promising copper deposits are being developed on the west coast, and on the east coast are large and important coal mines.

The Coast Range naturally has no river systems, nor, except in California, is it a barrier to rivers of the interior. It is crossed by the Columbia, Coquille, Rogue, Klamath and other rivers.

For mineral resources of the range see Coal; Petroleum. See also British Columbia; California; Oregon; Washington.

COASTAL PLAIN. Where the foothills of a range of mountains descend to a lowland that slopes gently to the sea, this lowland is called a coastal plain. It represents what was once the sea floor, being composed of material eroded from the mountains and deposited in the sea. With further elevation the original surface of the plain may be removed by streams cutting their valleys and by the weathering of the valley slopes. The coastal plain of the Atlantic Seaboard extends from New York to Georgia. In the Carolinas and Georgia it is divisible into belts parallel to the shore. The outer is a smooth plain, often swampy, perhaps 50 miles wide with a gently rolling surface. Farther inland, where the streams have cut valleys, the surface is more hilly, and 100 miles inland is a belt of hilly country some 600 or 700 feet high covered with pine forests where the original surface of the plain has been nearly destroyed. Back of this come the higher hills, formerly mountains, of the old land, forming what is known as the Piedmont belt. Other instances of coastal plains are the east coast of Mexico, north and south of Vera Cruz, and the east coast of India, skirting the Bay of Bengal.

COASTING TRADE, trade carried on by sea between the ports of the same country. In some countries the coasting trade is retained as a home monopoly, and this used to be the case in the United Kingdom, but by recent laws the coasting trade of Great Britain has been opened to foreign vessels, subject to the same rules, dues and regulations as British sailing ships and steamers; but power was given to impose by an order in council retaliatory prohibitions and restrictions on the ships of such countries as should impose restrictions and prohibitions on British ships. The dues and regulations to which vessels engaged in the coasting trade are subject are different from those which relate to vessels engaged in the oversea trade, and masters are required to keep books showing that their cargoes are strictly such as are allowable by the rules of the coasting trade. In the United States the coasting trade is restricted to vessels built and owned in the United States, as well as officered and chiefly manned by United States citizens. The term also includes colonies or dependencies overseas. The commerce of the Great Lakes is included in the coasting trade. The great length of the sea and lake coasts, the number of good harbors and the fact that much of the coast region of the United States has been settled, makes the coasting trade of this country the most extensive in the world. Many hundreds of sailing craft and steamers are used in this trade, carrying the products and people of one part of the country to other parts. This trade is increasing rapidly; the licensed tonnage of fisheries and trade in 1900 was 4,338,145 tons, an increase of nearly 1,250,000 tons in the preceding 50 years. In 1915 the licensed tonnage in the coasting and fishing trade was 6,486,384 tons and 23,072 vessels. Consult ‘Annual Reports’ of the Commissioner of Navigation.

COAT OF ARMS, heraldic insignia, originally embroidered on the tabard, a short coat worn by knights over the armor. They originated in the age of chivalry, when they were assumed as emblematic of the adventures and hopes of the knight, and were useful for distinguishing individuals whom it was difficult to recognize when in full armor. The favorite emblem of the knight later became the adopted badge of the family; the figures or characters employed in the coat of arms began to receive names, and so the language and science of heraldry came into existence. Modern nations have adopted coats of arms, in monarchical countries, sometimes an adaptation of the heraldic insignia of a dynasty. The coats of arms of the United States and of the individual States are arbitrarily adopted emblems without true heraldic significance. The emblem of a State sometimes represents its leading industry; some cities have also adopted similar coats of arms. See HERALDRY.

COAT OF MAIL, a piece of armor in the form of a shirt, consisting of a close net-work of iron or steel rings, or of a strong linen or leather jacket covered with small laminæ or plates, usually of tempered iron, overlapping each other like the scales of a fish. See ARMS AND ARMOR.

COATBRIDGE, kōt'brĭj, Scotland, municipal burgh in Lanarkshire, nine and a half miles east of Glasgow. It owes its rise to the working of the coal and iron-stone found in the surrounding district, and has grown rapidly from a village to a flourishing town. All the heavier metallurgical industries are here actively prosecuted. Nearly one-half of the blast-furnaces of Scotland are situated in this locality. Pop. 43,286.

COATES, Florence Earle, American author: b. Philadelphia, Pa., 1 July 1850. She was educated at private schools in New England and at the Convent of the Sacred Heart, France; she also studied some time at Brussels. In 1879 she was married to Edward Hornor Coates. She was president of the Browning Society of Philadelphia 1895–1903, and 1907–08; is member of the Society of Mayflower Descendants and the Colonial Dames of America. She has published ‘Poems’ (1898); ‘Mine and Thine’ (1904); ‘Lyrics of Life’ (1909); ‘Ode on the Coronation of King George V’ (1911); ‘The Unconquered Air, and Other Poems’ (1912). She is a contributor to *Harper's*, *The Century*, *Scribner's Magazine*, the *Atlantic Monthly* and the *Athenæum*, London.

COATESVILLE, Pa., borough of Chester County, 39 miles west of Philadelphia, situated on the Pennsylvania and the Philadelphia and Reading railroads. It contains a fine Y. M. C. A. building, a hospital, and is noted as an industrial centre, the establishments including iron and steel works, steel-plate mills, boiler works, brass and iron foundries, machine shops, a tube mill, silk mills and factories of tobacco, phosphate and automobiles. Settled about 1800, Coatesville was incorporated in 1867. The government is vested in a burgess, elected every three years, and a borough council chosen on a general ticket. There are municipal waterworks. Pop. 11,084.

COATI, kō-ă-tē, an American animal somewhat related to the raccoons, of which two species are known, constituting the genus *Nasua*. One inhabits Mexico and roves as far north as southern Arizona; the other lives in Brazil. The Mexican coati, or “coati-mundi” (*N. nasica*) is about the size of a house-cat, has a long cartilaginous snout which may be reflexed or stiffened at will, according to its owner's needs. Its fur is long, thick and a warm brown in color; and its tail is ringed like that of a raccoon. The Brazilian coati (*N. rufa*) is somewhat smaller than the Mexican and its fur is not so fine. Both species feed on fruits, eggs, insects, and sometimes on small birds. They are readily tamed and make as good pets as the domestic cat. There are fossil remains of these animals from the Pleistocene period, and judging from these there was one species at least which was larger than any living one. Consult *Popular Science Monthly* (Vol. II, New York 1872); *American Naturalist* (Vol. X, Boston 1877); and ‘Proceedings’ of the United States National Museum (Washington 1889).

COATICOOK, kō-ăt'i-kuk, Canada, town of Stanstead County, Quebec, situated on the Coaticook River, and the Grand Trunk Railroad. It has a number of factories and is a manufacturing centre. Pop. 3,165.

COATZACOALCOS, kō-ät"-sa-kō-äl'kōs, or **SNAKE RIVER,** a river of the isthmus of Tehuantepec in Mexico, which rises in the Sierra Madre and empties into the Gulf of Mexico, 130 miles southeast of Vera Cruz. It is navigable for large vessels for 30 miles, and is interesting as part of a route which has been surveyed for an inter-oceanic canal. A city of the same name, with a population of about 3,000, is situated at the mouth of the river.

COBALT, a metal which occurs combined with arsenic, nickel and other metals; also as a sulphide and as an arsenate. After the ore has been calcined, oxide of cobalt remains, but impure from the presence of other metallic oxides. When this oxide has been purified and reduced to the metallic state the cobalt is obtained of a white color inclining to gray, and, if tarnished, to red, with a moderate lustre. Its fracture is compact; it is hard, brittle and of a specific gravity of 8.5 to 8.9. Like nickel, it is strongly magnetic. It undergoes little change in the air, but absorbs oxygen when heated in open vessels. It is attacked, though slowly, by sulphuric or hydrochloric acid, and is readily oxidized by means of nitric acid. Two basic oxides of cobalt are known, and some intermediate oxides. The protoxide is of an ash-gray color and is the basis of the salts of cobalt, most of which are of a pink hue. When heated to redness in an open vessel it absorbs oxygen and is converted into a higher oxide. It may be prepared by decomposing the carbonate of cobalt by heat in a vessel from which atmospheric air is excluded. It is easily known by its giving a blue tint to borax when melted with it. It is employed in the arts, in the form of smalt, for communicating a similar color to glass, earthenware and porcelain. *Smalt,* or powder blue, is made by melting three parts of fine white sand, or of calcined flints, with two of purified pearl-ash and one of cobalt ore previously calcined, and ladling it out of the pots into a vessel of cold water; after which the dark-blue glass, or zaffer, is ground, washed and distributed into different shades of color, which shades are occasioned by the different qualities of the ore and the coarser or finer grinding of the powder. Smalt, besides being used to stain glass and pottery, is often substituted, in painting, for ultramarine blue, and is likewise employed to give to paper and linen a bluish tinge. The chloride of cobalt is well known as a *sympathetic ink.* When diluted with water so as to form a pale pink solution, and then employed as ink, the letters, which are invisible in the cold, become blue if gently heated. It is prepared by dissolving precipitated oxide of cobalt in hydrochloric acid with the aid of heat, and diluting with water. The nitrate of cobalt is obtained by dissolving cobalt or its oxide in nitric acid and crystallizing the solution. It is a deliquescent red salt, which dissolves in water with a pink color. The peroxide of cobalt is black, and is formed by adding a solution of bleaching-powder to a cobaltous salt, or by passing a current of chlorine gas through water holding cobaltous hydrate in suspension. It does not unite with acids; and when digested in hydrochloric acid the cobaltous chloride is generated with the disengagement of chlorine. When heated it is converted into one of the intermediate oxides.

Ores of Cobalt.— "Bright white cobalt ore" is the popular name for the mineral cobaltite (q.v.), a sulph-arsenide of cobalt. "Gray cobalt ore," also sometimes called "tin-white cobalt," is the mineral smaltite (q.v.). It is the chief ore of cobalt and is essentially cobalt diarsenide, though it always contains nickel and iron. "Red cobalt," also known as "cobalt-bloom," is the mineral erythrite (q.v.), a hydrous cobalt arsenate. "Earthy cobalt," or "black cobalt," is the mineral asbolite, a variety of wad containing up to 32 per cent oxide of cobalt. "Cobalt pyrites" is the mineral linnæite, a sulphide of cobalt, often containing much nickel. The principal supply of cobalt was formerly derived from the smaltite of Germany and the cobaltite of Norway and Sweden. The discovery, about 1904, of rich cobalt and silver ores in northern Ontario has made the town of Cobalt the centre of production. In the cobalt district smaltite and cobaltite occur in veins with native silver and other metallic minerals in rocks of Pre-Cambrian Age.

COBALT, Canada. Situated on Lake Cobalt, in northern Ontario, 330 miles north of Toronto. It was unknown up till 1903 as either town or mining camp. It was during the building of the Timiskaming and Northern Ontario Railway, a work of the provincial government, that the first valuable silver ores were discovered which have since proved this district to contain the richest silver camp in the world. The discoveries of 1903 were followed by others in the succeeding years, but it was not till 1906 that the "boom" reached its height. In 1904 the value of silver extracted from four producing mines was $111,887 and this went up by leaps until in 1911 the limit was reached, the 34 mines producing 31,507,791 ounces, of the value of $15,953,847. Since then a steady decrease has taken place, the output of silver in 1914 being 25,217,994 ounces of the value of $12,765,461, a falling off as compared with 1913 of 4,506,937 ounces, or 15 per cent. Unless new rich deposits are discovered, this decline is likely to be accelerated. The ores of the Cobalt district, which were first shipped to the United States, are now mainly treated in Canada. The discoveries at Cobalt brought Canada at a bound into a front rank as a silver producer, being excelled only by the United States and Mexico. This district is not only famous for its silver production, but it leads in cobalt and arsenic, and is excelled in output of nickel only by Sudbury and New Caledonia. One remarkable result of development at Cobalt is shown in the relation the dividends paid bear to the total value of production, these reaching up till the end of 1914 the enormous total of $55,228,964, or 50 per cent of the gross value of all the silver yet produced from the mines of Cobalt. Pop. 5,638.

COBALT-BLUE, or **THENARD'S BLUE,** a compound of alumina and the oxides of cobalt, forming a beautiful pigment often used in the arts. Sometimes it contains also the phosphate or arsenate of cobalt, according to the mode of manufacture employed. It is non-poisonous and unacted on by acids and alkalis.

COBALTITE, "bright-white cobalt," an important ore of cobalt, is its sulph-arsenide, CoAsS, and contains 35.5 per cent of cobalt. It occurs granular massive, but also in isometric-pyritohedral crystals. These usually have a brilliant metallic lustre and a white color slightly tinged with copper-red. Their hardness is 5.5 and specific gravity 6 to 6.3. The most important localities are in Norway, Sweden and Cobalt, Ontario.

COBAN, kō-bän', or **VERA PAZ**, Guatemala, city 90 miles northeast of the city of Guatemala. It is the capital of the department of Alta Vera Paz, on the left bank and near the source of the Cojabón. It was formerly a mission station of the Dominicans, whose memory is still revered. It is picturesquely situated on the slopes of a hill and is irregularly built. Its modern buildings are of some merit. The town has minor manufactures and is the centre of a fertile district producing coffee, cocoa, vanilla and sugar cane. Pop. 30,770.

COBB, Henry Ives, American architect: b. Brookline, Mass., 19 Aug. 1859. He studied at the Massachusetts Institute of Technology and was graduated at Harvard in 1880. In 1881 he established himself in Chicago, and has built up a large and lucrative general practice in that city and other parts of the country. In 1893 he was one of the national board of architects of the World's Columbian Exposition, for which he designed the Horticultural Hall, and at present is retained as a special architect for the United States government. Among the prominent public buildings erected from his design are the Newberry Library, city hall, courthouse, the operahouse, University of Chicago and church of the Atonement, all in Chicago; the Pennsylvania State Capitol at Harrisburg; American University at Washington, D. C.; Booth Memorial Theatre, New York, and government buildings at Chicago, League Island, Annapolis, etc.

COBB, Howell, American statesman: b. Cherry Hill, Ga., 7 Sept. 1815; d. New York city, 9 Oct. 1868. He was graduated at Franklin College in 1834, became a lawyer in 1836 and in 1843 was elected to Congress as a Democrat. He served eight years and was speaker of the House one term. Elected governor of Georgia in 1851, he returned to Congress in 1855, and was made Secretary of the Treasury by President Buchanan in 1857, resigning in 1860 to urge secession. As president of the Confederate Congress he assisted in drafting and adopting the Confederate constitution. He withdrew because of his disapproval of Jefferson Davis. He held a Confederate military commission in the Civil War, but saw little service. In defense of slavery he published 'A Scriptural Examination of the Institution of Slavery' (1856).

COBB, Irvin Shrewsbury, American author and humorist: b. Paducah, Ky., 23 June 1876. He was a shorthand reporter and contributor to comic weeklies until the age of 17; became editor of the Paducah *Daily News* at 19; and after holding important offices on minor newspapers became special writer and editor of the humorous section of the New York *Evening Sun* (1904–05); New York *Evening World* and *Sunday World* (1905–11); war correspondent for the *Saturday Evening Post* (1914–15), and lecturer on the war (1915). He has written plays, including 'Funabashi' (a musical comedy, 1907); 'Back Home' (written with Bayard Veiller, produced 1915); 'Guilty as Charged' (written with Harry Burke, produced 1915); and his books, 'Cobb's Anatomy' (1912); 'The Escape of Mr. Trimm' (1913); 'Cobb's Bill of Fare' (1913); 'Roughing it de Luxe' (1914); 'Europe Revised' (1914); 'Fibble, D.D.' (1916); 'Those Times and These' (1917). He also wrote series of stories and humorous essays, 'New York Through the Funny Glass'; 'Live Talks with Dead Ones'; 'The Hotel Clerk,' etc. He has written for many magazines.

COBB, Nathan Augustus, American scientist: b. Spencer, Mass., 30 June 1859. He was graduated at the Worcester Polytechnic Institute in 1881 and later studied at Jena under Haeckel, Hertwig, Lang and Stahl. From 1891 to 1904 he was engaged as pathologist in the Department of Agriculture, New South Wales. In 1904–07 he was director of the division of pathology of the Hawaiian Sugar Planters' Experiment Station, Honolulu. In 1907 he became agricultural technologist of the Department of Agriculture of the United States, and also since 1911 has served as acting assistant chief of the Bureau of Plant Industry. He has discovered and described about 1,000 new species of animals and plants of various parts of the world, mostly nematodes. He has invented photographic and microscopic apparatus. He has written about 150 pamphlets and books, mostly on results of original research.

COBB, Sylvanus, American Universalist minister: b. Norway, Me., 1799; d. 1866. He took a prominent part in the anti-slavery and temperance movements, was for 20 years editor of the *Christian Freeman* of Boston. He was the author of 'The New Testament, with Explanatory Notes' (1864); 'A Compend of Divinity'; 'Discussions'; 'Autobiography' (Boston 1867).

COBB, Sylvanus, American novelist, son of the preceding: b. Waterville, Me., 1823; d. Hyde Park, Mass., 2 July 1887. He was editor and publisher of a periodical called the *Rechabite*, and besides contributing to other publications was a most prolific story-writer. His most popular novels are 'The King's Talisman' (1851); 'The Patriot Cruiser' (1859); 'Ben Hamed' (1864); 'The Gunmaker of Moscow.' He published a 'Memoir' with his father's 'Autobiography' (Boston 1867).

COBB, Thomas Reed Rootes, American lawyer and soldier: b. Cherry Hill, Jefferson County, Ga., 10 April 1823; d. Fredericksburg, Va., 13 Dec. 1862. He was graduated at the University of Georgia 1841, was admitted to the bar and was reporter of the Georgia Supreme Court 1849–57. As a lawyer he enjoyed a wide reputation and large practice. In the Confederate Congress he was chairman of the Committee on Military Affairs, but later became a brigadier-general in the army and was killed at the battle of Fredericksburg. He wrote 'Digest of the Statute Laws of Georgia' (1851); 'Inquiry Into the Law of Negro Slavery in the United States' (1858); 'Historical Sketch of Slavery from the Earliest Periods' (1859).

COBB, William Henry, American librarian: b. Rochester, Mass., 2 April 1846. He was graduated at Amherst College in 1867, was ordained to the Congregational ministry in 1872. He held pastorates at Plymouth, Mass., 1872–76, and Uxbridge, Mass., 1878–

87. In 1887 he was appointed librarian of the Congregational Library and assistant treasurer of the American Congregational Association, Boston. He was one of the three editors and publishers of the *Journal of Biblical Literature* after 1889. He has published 'A Criticism of Systems of Hebrew Metre' (1905); 'The Meaning of Christian Unity' (1915); also many articles in 'Biblioteca Sacra' (1873–99) and in the *Journal of Biblical Literature.*

COBBE, kŏb, **Frances Power**, Irish philanthropist and religious writer: b. Dublin, 4 Dec. 1822; d. Aengwrt, Merioneth, 5 April 1904. She was one of the founders of the National Anti-Vivisection Society. Some of her works are descriptions of her travels in Italy, Greece, Egypt and Palestine, the others treating mainly of theological, religious and humanitarian questions. In religion she had moved from orthodoxy to rationalism. The most important are 'Essay on Intuitive Morals' (1855); 'Pursuits of Women' (1863); 'Broken Lights: an Inquiry into the Present Condition and Future Prospects of Religious Faith' (1864); 'Hours of Work and Play' (1867); 'Dawning Lights' (1868); 'Darwinism in Morals' (1872); 'The Hopes of the Human Race' (1874); 'Duties of Women' (1881); 'The Peak in Darien' (1882), and 'The Scientific Spirit of the Age' (1888). She also wrote an enormous number of pamphlets and edited an edition of the works of Theodore Parker.

COBBETT, William, English writer and politician; was the son of a farmer and publican: b. Farnham, Surrey, 9 March 1762; d. near Guildford, 18 June 1835. In 1783 he set out to try his fortune in London and arrived there with only a half a crown in his pocket. He succeeded in obtaining a situation as copying clerk to an attorney of Gray's Inn, where he remained for nine months. Determined to find some other sphere of employment, he left London for Chatham, enlisted in the 54th Regiment, and after continuing there for a year proceeded with it to Nova Scotia. During his stay at Chatham he had set himself assiduously to study and the improvement of his mind. He remained four years in America, during which time his regular habits and ability and attention in the discharge of his military duties effected his promotion to the rank of sergeant-major. In 1791 he returned to England with the regiment and shortly after arriving there obtained his discharge. After a short stay in England and a stay of six months in France in 1792 he embarked at Havre for America. He landed in New York in October 1792 and continued in America for eight years, where he occupied himself with literary labors, chiefly of a political kind, commencing his career by an attack on Dr. Priestley, then recently landed in America, in a pamphlet entitled 'Observations on the Emigration of a Martyr to the Cause of Liberty,' and signed «Peter Porcupine.» Under this famous *nom-de-plume* a succession of papers appeared, all of a strongly anti-Republican tendency, which were afterward republished in England. Before leaving America he published a life of Thomas Paine. In June 1800 he sailed for England, and on his arrival started the *Porcupine,* which zealously supported the measures of Pitt, but met with little success. In a subsequent paper, the *Weekly Register,* he was more fortunate; and it continued to appear regularly every week up to the period of his death. Not long after its commencement symptoms of a gradual change began to appear in Cobbett's political opinions, and from highly conservative he passed over to extreme radical principles. In 1803 a prosecution for libel on the lord-lieutenant and other officers of state in Ireland was instituted against him and resulted in his being sentenced the following year to a fine of $2,500; while a second action, brought almost immediately afterward, subjected him to a second fine of the same amount. In 1810, owing to some remarks of his in the *Register* of 10 July 1809, on the flogging of some militiamen, he was again prosecuted for libel and sentenced to imprisonment for two years and a fine of $5,000. This last was paid by a subscription among his friends. Nowise daunted, he continued his attacks on government as soon as he was liberated and commenced his celebrated 'Twopenny Trash,' which reached a sale of 100,000, and from its supposed influence on the working classes brought about the passing of the noted Six Acts. Partly to escape their operation, he retreated to the United States, and remained here for two years, residing principally in Long Island. He returned to England in 1819 and in 1820 endeavored, unsuccessfully, to be returned member for the city of Coventry. About the same period he commenced in the *Register* a series of papers entitled 'Rural Rides,' afterward reprinted, which present most charming pictures of English country scenery and are among the best of his productions. In 1824–27 he published a 'History of the Protestant Reformation in England and Ireland,' in which he vilified Queen Elizabeth and the leading reformers, but added in no way to his literary reputation. The work was eagerly adopted by the Roman Catholics, who caused translations to be made of it into various European languages. In 1831 he was again prosecuted for libel on the ground of an article in the *Register* alleged to be published with the view of exciting the agricultural laborers to acts of violence. He conducted his own defense in a speech of six hours, and the jury not being able to come to a verdict the trial ended in their discharge. On the passing of the reform bill in 1832 Cobbett was returned member to Parliament for Oldham; but his success in this capacity was indifferent. Nevertheless, at the general election in December 1834 he was again returned to Parliament for Oldham. In addition to the writings already referred to Cobbett is the author of an English and a French Grammar; 'Advice to Young Men and Women,' containing many useful hints; 'Cottage Economy'; 'Village Sermons'; 'A Year's Residence in America'; and other works. Cobbett wrote in a pure and vigorous English style, and his writings contain a great amount of information and sound practical advice. Consult E. Smith, 'Life of Cobbett' (1878).

COBBOLD, Thomas Spencer, English scientist: b. Ipswich 1828; d. 1886. He studied anatomy under Crosse and afterward took a regular medical course at the University of Edinburgh. He went to London in 1857 and for the four succeeding years lectured on botany at Saint Mary's Hospital. After 1861 he lectured at the Middlesex Hospital and later lectured on geology at the British Museum. In 1873 he was appointed professor of botany and later of helminthology at the Royal Veterinary College. His investigations were principally in connection with parasitic worms. His published works include ‘Entozoa: An Introduction to the Study of Helminthology, with Reference more particularly to the Internal Parasites of Man’ (1864); ‘Tapeworms’ (1866); ‘Worms’ (1872); ‘Parasites’ (1879); ‘The Parasites of Elephants’ (1882); ‘Human Parasites’ (1882); ‘Parasites of Meat and Prepared Flesh Foods’ (1884).

COBBS, Nicholas Hamner, American Protestant Episcopal bishop: b. Bedford County, Va., 5 Feb. 1796; d. Montgomery, Ala., 11 Jan. 1861. While studying for the ministry in the Episcopal Church he was engaged in teaching for several years. He was ordained deacon in Staunton, Va., in May 1824, and priest the next year in Richmond, Va., by Bishop Moore. He was occupied in pastoral work in his native county for 15 years. In 1839 he became rector of Saint Paul's, Petersburg, Va., and in 1843 accepted a call to the rectorship of Saint Paul's, Cincinnati, Ohio. In 1844 he was elected bishop of Alabama, being the first to preside over that diocese, and was consecrated in Philadelphia, 20 Oct. 1844. Bishop Cobbs was a faithful overseer of the work committed to his charge, and as evidence of esteem for his memory a noble charity in Montgomery bears the name of the Bishop Cobbs' Home for Orphans. He published some sermons and addresses.

COBDEN, Richard, English economist, the great «apostle of free trade»: b. Dunforo, Sussex, 3 June 1804; d. London, 2 April 1865. After receiving a very meagre education at the grammar school of Midhurst, he was taken as an apprentice into a Manchester warehouse in London belonging to his uncle, where he rapidly made up for the defects of his education by his own diligence and soon acquired a thorough acquaintance with the business. In 1831, being left to his own resources, he obtained some advances of money, and, with some relatives, started a cotton manufactory at Sabden, Lancashire, which in a few years succeeded in producing fabrics equal in point of quality to the best manufactured in London. By several journeys that he now made to France, Belgium, Switzerland and the United States, chiefly in the interest of the firm, he not only increased his business connections, but matured and enlarged his views. His first political writing was a pamphlet on England, Ireland and America, which was followed by another on Russia. In both of these he gave clear utterance to the political views to which he continued through his life rigidly to adhere, rejecting the course of policy based upon the theory of the balance of power, advocating non-intervention in the disputes of other nations and maintaining it to be the only proper object of the foreign policy of England to increase and strengthen her connections with foreign countries in the way of trade and peaceful intercourse. These views, although disregarded or considered as visionary in Parliament, were warmly received in industrial and commercial circles and secured Cobden a considerable number of followers, especially in Manchester. After returning from extensive travels in the East and in Germany, he entered actively on a course of agitation with the view of carrying into effect his political views. Soon after the Anti-Corn Law League was formed in 1838, it was joined by Cobden, who expended all his energies on behalf of the cause to support which the league had been founded; and it was chiefly the extraordinary activity and perseverance of Cobden, joined to the zeal of his supporter Bright, that brought about the final victory of free-trade principles. In 1841 Cobden was returned to Parliament by Stockport. In his very first speech in Parliament he took occasion to point out the unjust way in which the corn-laws operated, and, undeterred by the failure of his first attempts, returned again and again to this subject. After five years of unwearied contest he at last succeeded in convincing Sir Robert Peel himself, at that time Prime Minister, of the pernicious action of the corn-laws, and in inducing him to bring in a bill for their repeal. The bill passed both houses of Parliament before the end of June 1846, and Sir Robert Peel was the first to congratulate Cobden on his victory in a speech delivered in the House of Commons. During this long struggle Cobden had been obliged to neglect his business, which before agitation commenced had been a highly prosperous one. As a compensation for the loss he had thus sustained a national subscription was made and a sum of about $400,000 presented to him. After again visiting several countries on the Continent, where he was generally received with enthusiasm, he returned to his parliamentary duties in 1847, having been returned without opposition as one of the members for the West Riding of Yorkshire. He now appeared chiefly as the advocate of parliamentary reform, economy and retrenchment in the management of the finances of the country, and a policy of non-intervention; in all of which he found a firm and ready ally in Bright. His advocacy of a peace policy did not in every case add to his popularity. His opposition to the policy of Lord Aberdeen in 1853, which ultimately led to the Russian War, met with no success; and although in 1857 he carried a vote of censure on Lord Palmerston's Chinese policy, his action in this case was displeasing to the country generally. In 1860 he negotiated a treaty of commerce with France, and in reward for his services on this occasion was offered a baronetcy, a seat in the privy-council and several other offices and dignities, all of which he persistently refused. A collection of his political writings appeared in 1867 and a collection of his speeches ‘Speeches on Questions of Public Policy’ (1870). Consult Garnier, ‘R. Cobden, les Liguers et la Ligue’ (1846); McGilchrist, ‘Life of Richard Cobden’ (1865); Morley, ‘Life of Richard Cobden’ (1881–83); McCann, ‘Six Radical Thinkers’ (1910).

COBDEN CLUB, The, an organization named after Richard Cobden, formed about a year after his death, through the influence of John Bright and others, for encouraging the diffusion of free trade and the other economical and political principles with which Cobden's name is associated. The Cobden Club has distributed a vast number of books and pamphlets, especially in Great Britain, the United States and the British colonies.

COBEGO, kō-bā'gō. See COLUGO.

COBERN, Camden McCormack, American Methodist clergyman: b. Uniontown, Pa., 19 April 1855. He was educated at Allegheny College and the Theological School of Boston University and entered the ministry in 1876. He has been professor of English Bible and philosophy of religion at Allegheny College since 1906. He has published 'Ancient Egypt in the Light of Modern Discovery' (1892); 'Ezekiel and Daniel: a Critical Commentary' (1901); 'The Stars and the Book' (1904); 'Bible Etchings of Immortality' (1905); 'Recent Explorations in the Holy Land' (1914); 'The New Archæological Discoveries in their Bearing on the New Testament' (1916) and contributions to the *Homiletic Review, The Methodist Review* and to the proceedings of learned societies.

COBHAM, Lord. See OLDCASTLE, SIR JOHN.

COBIJA, kō-bē'hā, or **PUERTO LA MAR,** Chile, seaport in the province of Antofagasta (formerly belonging to Bolivia), on the shore of the Pacific, about 70 miles north of the town of Antofagasta. It stands in a desert region and is entirely dependent on the mines in the neighborhood. The roadstead is tolerably safe, but the landing-place is far from good. All the water used for drinking must be obtained by distillation and the means of subsistence come from a considerable distance. It was formerly a considerable town, but has lost its commerce and now contains a population of but 500. It was once the only seaport of Bolivia but was ceded to Chile in 1883. It suffered from an earthquake and tidal wave in 1877.

COBLE, or **COBBLE,** a flat-floored boat with a square stern, furnished with a lug-sail and also propelled with oars. It has a sharp, high bow, is admirably constructed for encountering a heavy swell, and is used in fishing, especially on the east coast of Great Britain. The rudder extends for some distance below the stern. There is also a small rowing-boat with the same name used by salmon-fishers and others.

COBLENZ, kō'blĕnts, Germany, a fortified city, anciently called *Confluentes,* from its situation at the confluence of the Rhine and Moselle. It is the capital of Rhenish Prussia and is finely situated on the left bank of the Rhine, in the angle between that river and the Moselle and connected by a pontoon bridge over the Rhine with Ehrenbreitstein. It consists of the old town, along the Moselle, and the new town, farther up the Rhine. Among the principal buildings are the church of Saint Castor, founded early in the 9th century by the son of Charlemagne; the Liebfrauen-Kirche of the 13th century; the so-called Kaufhaus, built in 1477 as a town-hall, the ancient Burg, erected by the archbishop of Treves in 1276, restored by the town; and the large electoral palace, now a royal palace, completed in 1786. In 1905 the government completed a magnificent new building in which to centre the activities of the province. At the extreme point of the city, at the junction of the rivers, stands the splendid equestrian statue of Emperor William I, erected by the province. Coblenz has numerous and excellent educational institutions, including a royal gymnasium, a teachers' seminary and a conservatory of music. Its chief industry is the production of the sparkling Moselle wine. There are also manufactures of ships, hats, machinery, pianos and lacquered wares. A system of four forts, including Ehrenbreitstein on the opposite bank of the Rhine, makes it very formidable. Metternich, the Austrian statesman, was born here in 1773.

Coblenz was known to the Romans as Confluentes. In 1018 it was conferred by Henry II upon the archbishops of Treves. After 1789 it was the headquarters of the French emigrés, and in 1794 it passed to France. In 1815 it was ceded to Prussia. Consult Daniel, 'Deutschland' (Leipzig 1895); Gunther, 'Geschichte der Stadt Koblenz' (Coblenz 1815); Bär, 'Urkunden und Akten zur Geschichte der Verfassung und Verwaltung der Stadt Koblenz bis zum Jahre 1500' (Bonn 1898). Pop. 56,487.

COBOURG, kō'bėrg, Canada, town, port of entry and county-seat of Northumberland County, Ontario, on the Grand Trunk Railway, 69 miles northeast of Toronto and 92 miles west by south of Kingston. It has a safe and commodious harbor on Lake Ontario and enjoys a large export trade in provisions, lumber, flour, etc. It has regular steamboat connection with the important United States and other Canadian lake ports. The town is well built and has many fine residences. It was formerly the seat of Victoria University (q.v.), now located at Toronto. It has woolen mills, a car factory, carpet and matting factory, breweries, etc., banks and weekly newspapers, electric lights, gas, electricity and waterworks. Pop. 5,074.

COBRA DE CAPELLO, the Portuguese name of an East Indian Elapine serpent, the *Naja tripudians,* and sometimes applied to its congeners, among which is the king cobra or hamadryad of India, *Naja bungarus,* and an African genus, the *Naja hæje,* or asp, all of which are reptiles of the most venomous nature. The former inhabits India and southeastern Asia, Java, etc. The ringhals of South Africa, *sepedon hæmachates,* is closely related, and is sometimes also known as cobra.

All are remarkable for the manner in which they spread out or distend the sides of the neck and head when disturbed or irritated. In the cobra de capello the conformation necessary to this action is found in the most perfect condition, as some of the ribs are loosely articulated and moved by appropriate muscles on the sides of the neck, which, when expanded, give the anterior part of the body the appearance of an overhanging arch or hood, on the middle of which, posterior to the eyes, is a greenish-yellow mark, resembling the rim of a pair of spectacles. From this mark we have the name «spectacled snake.» When disturbed by the approach of an individual or otherwise, the cobra raises the anterior part of its body, so as to appear to stand erect, expands its hood and is prepared to inflict a deadly wound. The poison fangs are attached to the anterior end of the maxillary bone and are permanently erect, not movable, as in the rattlesnakes. So exceedingly poisonous is its bite that in numerous instances which are well authenticated death has followed within a few minutes; under ordinary circumstances a few hours is the longest term that intervenes from the infliction of the bite till the death of the sufferer, where prompt measures for his relief have not been resorted to. So numerous are these snakes in India, and so bold in frequenting human habitations, that the census returns attribute not less than 10,000 deaths annually to their bites.

The cobra may be as much as six and a half feet long and two inches through.

To minister to the curiosity of the multitude, the jugglers of India select these venomous reptiles for their exhibitions and having extracted their fangs keep them in cages or baskets to exhibit as dancing snakes. When the cage is opened, the juggler begins playing upon a pipe or other instrument; whereupon the cobra assumes the erect attitude, distends its hood and remains balancing itself in this position until the music is suspended. It is possible that this snake, in common with lizards and other animals, is peculiarly affected by musical sounds, but it is much more likely that the swaying of the body of the charmer baffles the snake's attempt to strike. With the exception of the spectacle mark on the back of the neck and its distensible hood, the cobra is not especially distinguished as regards coloration or form. Consult Ditmars, ‹Reptiles of the World› (New York 1910); Boulenger, ‹Snakes of the British Museum› (London 1893–96); Genther, ‹Reptiles of British India› (London 1901); Gadow, ‹Amphibia and Reptiles› (London 1901). See Hamadryad.

COBURG, kō'boorg, a noted family of Germany, dating from the 5th century, distinguished for intermarriages with royal houses, especially during the 19th century. A sister of Duke Ernest I became Duchess of Kent and mother of Queen Victoria; the duke's brother Leopold became king of the Belgians and married in succession daughters of George IV of England and of Louis Philippe; one of his nephews, Ferdinand, married the queen of Portugal and was regent of that kingdom, 1853; another, August, married a daughter of Louis Philippe; one of his sons, Duke Ernest II, declined the crown of Greece, 1863, and another, Prince Albert, was the husband of his cousin, Queen Victoria of England.

COBURG, or **KOBURG**, Germany, capital of the duchy of Saxe-Coburg-Gotha, situated on the left bank of the Itz, 106 miles east by north of Frankfort-on-the-Main. Among the principal buildings is the Ehrenburg Palace, one of the town residences of the Duke of Saxe-Coburg-Gotha, formerly a monastery of the Recollets, but converted into a ducal residence in 1549. It contains some interesting pictures, tapestry, etc. Some of the old doors exhibit beautiful specimens of marquetry or inlaid work. There are one or two other palaces and various monuments, including a statue of Prince Albert, consort of Queen Victoria. The chief church is the Moritzkirche, a spacious building in the late Gothic style, with a tower 334 feet high. The government house is a handsome structure in the Italian style. The educational institutions comprise a gymnasium (founded in 1605), real school, normal school, etc. On an eminence overhanging the town is the ancient castle or fortress, now a museum, from which extensive views are obtained. In the museum are relics and writings of Luther, who resided here for three months in 1530, and here wrote some of his works. This castle was occupied by the Swedes in 1632, and was unsuccessfully besieged by Wallenstein during the Thirty Years' War. Coburg has manufactories of porcelain and ceramic wares, carriages, furniture, etc., and has also malt-works, breweries, woolen and linen mills, machine works, colors, ironwork, lumber and basketware manufactories. Pop. 23,794.

COBURN, Foster Dwight, American farmer and agricultural writer: b. Jefferson County, Wis., 7 May 1846. After serving in two Illinois infantry regiments during the Civil War he went to Kansas in 1867. The agriculture of Kansas owes much to his expert knowledge and enthusiasm. He became secretary of the Kansas board of agriculture in 1882, and later, in 1894, holding the position until he resigned, 1 July 1914. He was chief of the department of live stock at the Saint Louis Exposition (1904). He was repeatedly a member of the board of regents of the State Agricultural College and president of the State Temperance Union; was editor for five years of the *Kansas Live Stock Indicator*. He is vice-president and director of the Prudential Trust Company, also of the Capitol Building and Loan Association, and director of the Bank of Topeka. In 1906 he refused an appointment as United States senator. He published ‹Swine Husbandry› (1904); ‹Alfalfa› (1901); ‹The Book of Alfalfa› (1906); ‹Swine in America› (1909); ‹Farm Poultry›; ‹Silos and Silage›; and about 30 volumes on agriculture published by the State of Kansas.

COCA (*Erythroxylon coca*), a shrubby plant belonging to the family *Erythroxylaceæ*, found wild in the mountainous regions of Peru and Bolivia, and cultivated in districts 2,000 to 5,000 feet or more above sea-level. The leaves are gathered and dried in the sun, and chewed with a little powdered chalk. When taken in some quantity they produce an intoxication like that of opium. As the indulgence is repeated the appetite for it increases, while that for wholesome nourishment diminishes; the miserable victim loses all power of resisting his craving and becomes reduced to a condition of physical and mental prostration. When used in moderation coca lessens the appetite for food and enables those who have partaken of it to sustain greater fatigue than they otherwise could. It has been found the best preventive of asthmatic symptoms caused by the rapid ascent of lofty mountains. An infusion of the leaves is also used with the same effect.

COCAINE, kō'ka-ĭn, a vegetable alkaloid, with the chemical formula $C_{17}H_{21}NO_4$, obtained from the leaves of the coca shrub (*Erythroxylon coca*) growing on the eastern slopes of the Andes and cultivated in Peru, Bolivia, Colombia and Brazil, and in Java, Ceylon and the Malay States. Cocaine was first isolated by Niemann in 1860. Its anæsthetic qualities were discovered by von Anrep in 1880, but it did not come into use as a surgical adjunct until Koller in 1884 began to employ it to produce local anæsthesia in operations upon the eye.

The leaves of the coca contain alkaloids of four types: (1) Cocaines — alkyl acyl derivatives of ecgonine; (2) acylecgonines — acyl derivatives of ecgonine; (3) pseudotropeines — acyl derivatives of pseudotropeine; and (4) hygrines. The first and second types may be used as commercial sources of ecgonine, and thus for the manufacture of crystalline cocaine — benzomethyl ecgonine. The South American leaves yield about 1 per cent of total alkaloids, mostly cocaine; the Ceylon and Malay leaves contain up to 1.6 per cent of total alkaloids, of which about 65 per cent is cocaine; the Java leaves contain 1.6 per cent of alkaloids, scarcely any of which is cocaine, but from which cocaine is readily obtained.

In Peru the coca leaves are macerated in water containing dilute sulphuric acid in a series of four vessels, in each of which the leaves remain four days, the liquor being changed every day from the oldest tank to the next newer, the leaves from the oldest being thrown away. To this concentrated liquor is added carbonate of soda in a 60° (Be) solution. This precipitates the cocaine in solid form. Petroleum is then introduced and the whole gently agitated. The petroleum takes up the cocaine and is then washed with water to remove the last trace of acid. It is then treated with water containing dilute sulphuric acid in which the cocaine is redissolved, the whole being violently agitated for 30 to 40 minutes. After standing a short time the cocaine solution is drawn off, leaving the oil to be used again. The acid solution is treated with sodium carbonate and allowed to stand 12 hours, and then passed through a filter which collects the precipitate. This is washed with distilled water and pressed into a brown paste in a filter press. Another method practised with the imported dry coca leaves is to macerate them, adding the sodium carbonate solution and the petroleum and agitating the mixture for some hours. The cocaine with cinnamyl cocaine (etc.) are taken up by the petroleum, which is then shaken with dilute hydrochloric acid. The resulting hydrochloride of cocaine crystallizes out and is pressed and dried. This crude salt is purified by dissolving in water, liberating the free base by ammonia and redissolving in alcoholic hydrogen chloride. The pure cocaine hydrochloride crystallizes out. The mother liquor contains the other coca alkaloids, and these are converted into cocaine by heating with boiling hydrochloric acid and pouring into water. The truxillic acids separate and are filtered off. The filtrate is concentrated until ecgonine hydrochloride crystallizes out. This is benzoylated and methylated in turn to produce cocaine.

The crude cocaine of commerce is converted into hydrochloride, in which form it is used as a drug, by first dissolving it in dilute hydrochloric acid and then treating cold with a solution of potassium permanganate — which destroys the larger part of the alkaloids accompanying the cocaine before attacking the latter. At that point the action is checked by adding sodium carbonate, and the precipitate is taken up with ether. The ether solution is evaporated to dryness and the residue dissolved in acetone and treated with hydrochloric acid.

Cocaine crystallizes from its alcoholic solution in small monoclinic prisms which melt at 208° F. and dissolve sparingly in cold water — though fairly in hot water — and freely in ether and alcohol. The hydrochloride is readily soluble in water.

Salts of cocaine are precipitated from solution by numerous reagents, among which are ammonia, caustic potash, sodium carbonate, picric acid, tannic acid, gold trichloride and platinum tetrachloride. Cocaine when taken internally is a cerebral stimulant, and moderate doses usually cause a pleasant sense of exhilaration and temporary increase in mental and physical power, though accompanied by a more or less complete loss of moral sensibility. This condition is followed by a corresponding period of depression. The sense of hunger and fatigue is lessened so that privations may for the time being be better endured under the influence of the drug. Moderate doses powerfully stimulate respiration, and, to a less degree, the heart and circulation. The body temperature is not affected by small amounts, but in overdose it may be elevated several degrees. The drug is to a large extent oxidized in the body, though small amounts may be excreted by the kidneys. It is alleged that the quantity of nitrogenous material eliminated in the urine is decreased, indicating a reduction in tissue waste, but this has not yet been clearly proved. In poisonous doses cocaine produces narcosis — sometimes with epileptiform convulsions — with depression, followed by paralysis, of the sensory nerves and to a less degree of the motor nerves. The symptoms of poisoning vary greatly in different individuals. Moderately toxic amounts may give rise to disagreeable mental excitement and unrest, nausea, faintness, pallor, cold perspiration and prostration, or to a sense of malaise and depression. Large doses cause rapid respiration, feeble and accelerated heart action, dilated pupils, headache, dryness of the throat and muscular twitchings. General convulsions may supervene — or collapse occurs, the skin is cyanotic and cold, the blood pressure falls through great cardiac depression, respiration becomes slow and shallow and death occurs through failure of this function. The treatment of poisoning includes the evacuation of the stomach if the drug has been taken by mouth, and the use of stimulants such as ammonia, coffee, strychnine, ether or alcohol. If convulsions are present these must be combatted by the inhalation of small amounts of ether or chloroform and the cautious administration of sedatives. Morphine is said to be the best physiological antidote. Cocaine is used internally to some extent as a stimulant in certain febrile and mental conditions, as well as on account of its topical action in gastric disorders or in obstinate vomiting, but its most important field of utility is the production of local anæthesia in minor surgery. When applied externally in proper strength it produces a loss of sensation, particularly to pain and touch, through paralysis of the terminations of the sensory nerves. Applied to the eye it causes anæsthesia, contraction of the blood vessels, reduction of intraocular tension and dilation of the pupil, but the reflex to light is not lost and there is little or no paralysis of accommodation. Brought into contact with the tongue it destroys the sense of taste for bitter substances, though salt may still be recognized and sweet and sour fluids do not entirely lose their flavor. The sense of smell may be entirely abolished by the application of cocaine to the mucous membrane of the nose, but it is not absorbed from the unbroken skin. When injected under the skin or applied to mucous membranes a feeling of numbness is produced and incisions or other painful manipulations may be practised on the part so treated without giving rise to discomfort. For this purpose solutions varying in strength from 2 to 10 per cent are usually employed.

The applicability of local anæsthesia has been greatly extended by means of what is called nerve blocking. It has been found that on the injection of a small amount of a weak solution of cocaine into the trunk of the main nerve supplying a part, sensation is cut off in that region and painless operating is possible. A plan which enables extensive areas to be anæsthetized with but small amounts of the drug is called Schleich's infiltration method. For this purpose a very weak solution of cocaine, morphine and sodium chloride is injected into the tissues until considerable local swelling or edema is caused. In this way the effect of pressure on the local nerve filaments and the local anæmia combine to aid the action of the very small amounts of the alkaloids.

A very great advance was made when it was found that it was practicable to produce anæsthesia embracing almost the entire body by injecting cocaine solutions into the spinal cord by means of a long hypodermic needle usually inserted between the fourth and fifth lumbar vertebræ. Anæsthesia of the legs and trunk about as high as the breasts is produced within 15 minutes and lasts from two to five hours. For this purpose as for use in other ways small quantities of adrenalin are often added to the cocaine solution with the idea of neutralizing some of its undesirable qualities. Spinal anæsthesia, however, is not altogether without dangers or drawbacks, and will probably never be used as a routine procedure.

Owing to the more or less serious disadvantages of cocaine, particularly its tendency to produce grave poisoning in some persons even when in small doses, and also because of the difficulty of sterilizing its solutions without impairing their virtue, substitutes have been sought by the synthetic chemists, and with much success. By various combinations with the groupings in atropine, to which cocaine is closely allied chemically, there have been developed eucaine-B, or beta-eucaine, nirvanine, novocaine, holocaine, stovaine and alypine. These all produce, when administered in sufficient quantity, a slowing down and diminution in the extent of the respiration and a fall in blood pressure. Use is also made of tropacocaine, an alkaloid found in the Java coca leaves. It is less toxic, though quite as effective in local anæsthesia, as cocaine. The relative toxicity of these substances as compared with cocaine is approximately: cocaine, 100; alypine, 90; holocaine, 60; stovaine, 55; tropacocaine, 50; beta-eucaine, 40; nirvanine, 30; novocaine, 30.

Cocaine is sometimes used in the treatment of the morphine habit, not infrequently with the result that the victim only exchanges one form of bondage for another no less pernicious. Many persons innocently acquire the cocaine addiction through the use of various nostrums in the form of snuff or snuffing liquids, ostensibly intended for the cure of nasal catarrh, hay fever, etc. The temporary alleviation of his symptoms produced by the compound induces the sufferer to continue its use until he is fairly in the grip of a servitude leading to certain destruction unless its fetters are cast off by the exercise of almost superhuman fortitude. The cocaine habitué has to suffer from necrosis of the nasal cartilages, progressive loss of flesh and strength, digestive and circulatory disorders, trembling of the limbs, insomnia, headache, vertigo, etc. Hallucinations and even outbreaks of maniacal fury are not unusual and there is complete decadence of the mental and moral qualities. The cocaine fiend respects no convention or obligation, and will lie, steal or use any other base means to gratify his passion for the drug, being lost to all considerations of duty or social position.

In the endeavor to check the ravages of cocaine and other habit-forming drugs several of the States have passed laws more or less stringent. The Federal government has also aided to some extent with the so-called "Harrison bill," requiring the registration of all persons who sell or administer the drug, and these persons are required to record all sales. This law went into effect on 1 March 1915, and affected "every person producing, importing, manufacturing, compounding, dealing in, dispensing, selling, distributing, or giving away coca leaves or any derivative or preparation therefrom." During the first three months of the fiscal year ending 30 June 1916, the registry showed 167 importers, 567 manufacturers, 1,106 wholesale dealers, 47,156 retail dealers, 36,504 dentists, 123,734 physicians and surgeons, besides 10,726 veterinarians. The records of the bureau of foreign and domestic commerce show that in the fiscal year ended 30 June 1915 there were brought into the United States 1,048,312 pounds of dry coca leaves, and 179 ounces of cocaine, ecgonine and their derivatives — the equivalent of 218,000 ounces of cocaine. According to the United States Pharmacopœia of 1900 the average dose of cocaine is said to be 30 milligrams, or one-half grain, but deaths have been recorded from amounts not much larger than this. On the other hand recovery has been observed in cases in which 20 grains and more of the drug had been taken by mouth. See DRUG HABIT.

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COCAMA, kō-kä'mä, or **UCAYALES**, a tribe of Tupian stock inhabiting the banks of the lower Ucayali River, in northeastern Peru, also near Nauta on the left bank of the Amazon, opposite the mouth of the Ucayalí. Consult the works of De Castelnau and Marcoy and Rivet, 'Les langues guaranies du Haut-Amazone,' in *Journal de la Société des Américanistes de Paris* (Paris 1908).

COCANADA, kō'kä-nä'da, India, the capital of the Godavari District, Madras, 315 miles northeast of Madras, and the second city on the

Coromandel coast. It is connected by navigable canals with the Godavari River. The harbor is silting up and has caused the port trade to decrease. Great quantities of cotton are exported, also rice, sugar, oil, pulse and tobacco. Cheroots, iron and salt are manufactured. Pop. 54,110.

COCCEIUS, kŏk-tsā'yoos, **Heinrich von**, German jurist: b. Bremen 1644; d. 1719. He studied at Leyden and Oxford; was in 1672 professor of law at Heidelberg, and in 1688 at Utrecht; in 1690 regular professor of laws at Frankfort-on-the-Oder. He went to The Hague in 1702, without giving up his office, on occasion of the disputes as to the hereditary succession of the house of Orange; and received for his services, in 1713, the rank of baron of the empire. As a lawyer he was the oracle of many courts, and his system of German public law (‘Juris Publici Prudentia’) was almost a universal academical textbook of this science.

COCCEIUS, or KOCH, Johannes, Dutch theologian: b. Bremen 1603; d. 4 Nov. 1669. He studied at Hamburg and Franeker, under Sixtimes Amama, a noted biblical scholar. Returning to Bremen in 1630, he taught biblical philology at the Gymnasium there; and in 1636 became professor of Hebrew and theology at Franeker until 1650, when he became professor of theology at Leyden. He was the leading exponent of the «covenant» or «federal» theology, which taught that the covenant was the basis of theology. There were two covenants, one before the fall, the «Covenant of Works,» and after the fall the «Covenant of Grace,» to fulfil which the Messiah came. He found New Testament ideas in the Old Testament. A school of theologians which elaborated this philosophy were called «Cocceians.» His chief works were ‘Lexicon et Commentarius Sermonis Hebraici et Chaldaici’ (Leyden 1669), a work which is the first scholarly dictionary of the Hebrew language; and ‘Summa Doctrinæ de Fœdere et Testamento Dei’ (1648) in which his religious views are expounded. His collected works with a biography were published by his son in 12 folio volumes (Amsterdam 1673–75).

COCCO, COCOA-ROOT, EDDOES, TARO, various plants of the genera *Caladium* and *Colocasia* of the family *Araceæ*. They are widely cultivated for food in the tropical and subtropical islands of the Pacific, the West Indies and adjoining continental regions, and to a less extent in other warm countries. The edible part most desired is the starchy acrid tuber which is eaten like potatoes or made into *poi*, a substance obtained by roasting the tubers, pounding them with water to a paste and allowing the mass to ferment before being eaten either in that form or again prepared for the table. In this form the roots are a staple food of the Polynesians. During the process of roasting or boiling the tubers lose their acridity, which quality is, in some plants, almost wanting. The young leaves of some species are used as pot-herbs. The principal species is *Colocasia antiquorum* var. *esculentum*, a perennial herb with heart-shaped peltate green leaves often three feet long and nearly as wide, and an inconspicuous spadix. It is very popular as a bedding plant in the United States, since it gives a sub-tropical effect, especially when grouped with cannas and crotons. Popularly it is known as elephant's ear. It is easily grown, being started in the greenhouse, transplanted to the open ground after danger of frost, freely supplied with water and, at the approach of frost in the autumn, stored in a cool, dry cellar.

COCCOLITH, the name given in 1858, by Huxley to one of certain minute oval or globular calcareous bodies found in countless numbers in the ooze of the Atlantic, either detached or adherent to small pieces of protoplasm. They have since been dredged up from other places, and found in chalk, and, according to Guembel, in limestone of all ages. Carter thinks they belong to *Melobesia*, a genus of algæ.

COCCOSTEUS, a genus of fossil Arthrodira, sometimes classed with the Dipnoi, though regarded by others as aberrant Teleostomes, pertaining chiefly to the Devonian and Old Red Sandstone systems, but met with also in Silurian strata. The head and front of the trunk was protected by a great shield covered with tubercles. Besides this bony cuirass there was also a ventral shield, but the rest of the body was naked. The skull was autostylic. The mouth was furnished with small teeth, like those of the modern Dipnoi. Pectoral fins were lacking, but pelvic and dorsal fins were present. See DINICHTHYS; DIPNOI.

COCCULUS INDICUS, or fish-berry, as it is commonly known in the United States, is the seed of a herbaceous climbing vine (*Anamirta paniculata*), of the family *Menispermaceæ*. The dried berries are imported from the East Indies. The drupe resembles a round berry, the size of a pea or larger, wrinkled externally, and with a brittle husk. The kernel is intensely bitter. It contains about one-fiftieth of its weight of a powerful bitter narcotic poison called picrotoxin, also bases called menispermine, a crystalline base, paramenispermine, and several organic acids. Picrotoxin is used as an adulterant in enriching and imparting a bitter taste to malt beverages, and is thrown into rivers in which fish abound to stupefy them, so that they may be readily caught. It has been used in the form of an ointment in certain skin diseases, and in decoctions for killing vermin in the hair of children and animals, although death is sometimes caused through this latter use. The symptoms of poisoning are twitching and inco-ordination of the muscles, increased reflex excitability, convulsions, coma and death from asphyxia.

COCCUS, *in zoology*, a genus of insects of the order *Hemiptera*, family *Coccidæ*. See SCALE INSECTS; also COCHINEAL; KERMES; LAC.

In Medicine.— Coccus is also the name of a family of bacteria characterized by their spherical form and consisting of a number of genera, all named for certain growth characters. Thus cocci that grow in chains are termed *Streptococci* in which group the virulent bacteria that cause blood-poisoning, septicæmia, and the organism of erysipelas are found; cocci that grow in pairs are termed *diplococci*. The *diplococcus* of pneumonia and the *diplococcus* of gonorrhœa are in this group. Others grow in bunches,—*Staphylococci*. The common organism of pus is *Staphylococcus pyogenes aureus*, by bacteriologists usually called *S.p.a.* Other spherical forms are known as *Micrococci*, one of which group, the *Micrococcus urea*, is found in the urine as causative agent in excessive urinary fermentation. Some forms of this family group grow in packets. These are termed *Sarcinæ*. They are very abundant in the air, and are frequently associated with chronic gastric fermentations. A large number of different forms of this family are known, the greater majority of which are not pathogenic but very useful in agriculture and the arts, particularly in agricultural processes. As many as a hundred different species have been found in the air, and Chester has described 36 species of *Streptococcus*, 91 species of *Micrococcus* (*Staphylococcus* here included), 14 species of *Sarcinæ*, 3 species of *Planococci*, or movable *cocci*, and 3 species of *Planosarcinæ*. (See BACTERIA). Consult Chester, 'Manual of Determinative Bacteriology.'

COCCYGOMORPHÆ, a group of birds, proposed by Huxley, and nearly equivalent to the *Cuculiformes* of recent authors. See ORNITHOLOGY.

COCCYX, kŏk'sĭks. See OSTEOLOGY.

COCHABAMBA, kō-chä-bäm'bạ, Bolivia, a central department of the republic, bounded on the north by the department of Beni, on the east by Santa Cruz, on the south by Chuquisaca and Potosí, and on the west by Oruro and La Paz. Its area is about 22,000 square miles. The following list shows its provinces and the varieties of climate: Tarata, Mizque, Punata and Ayopaya are tropical; Chaparé, Tapacari, Totora, Arque and Furacares are semi-tropical; the capital district is temperate. The gold-mines at Choquecamata in Ayopaya have been worked for a long time, and were famous during the period of the Spanish supremacy. Silver and marble are found at Palca; gold and silver at Sayari; silver in Mizque, Colcha de Arque and Quioma. Cochabamba has been called «the granary of Bolivia.» It is the great wheat and maize growing section of the country, and is also noted for its fine horses bred from imported Peruvian and Chilean stock. All classes of agricultural products can be grown on the extensive and rich plains of Sacaba, province of Chaparé, where useful medicinal plants are also found, and alfalfa grows luxuriantly. In the province of Ayopaya there are great tracts of pasture land, and wool, barley, etc., are produced. In Tapacari all the European fruits and cereals thrive, and herds of llamas, cattle and horses abound. All cereals thrive in Mizque, a province which also contains extensive vineyards, and produces the excellent and nutritive Cochabamba corn. The agricultural products are manufactured on a limited scale. Pop. about 330,000.

COCHABAMBA, Bolivia, the capital of the department of the same name, on the Rio de la Rocha, in a fertile valley, about 8,000 feet above sea-level. It is laid out with wide and regular streets and contains several pretentious structures, notably the theatre, government building, and the hospitals of Viedma and San Salvador. It has a university, two colleges and secondary schools. The city manufactures cotton and woolen goods, leather, soap and earthenware, and besides carries on considerable trade, especially in grain. Cochabamba was founded in 1563 and was called Oropesa. In 1847 it was created an episcopal see. Pop. 24,512.

COCHEM, ko'ʜem, Prussia, capital of a district in the Rhine province, at the confluence of the Endert and Moselle, 24 miles southwest of Coblenz. It is beautifully situated, has a fine park on the river front. Here is a war monument by Schies. Nearby is the episcopal castle of the archbishops of Treves. It was destroyed by the French in 1689 and was restored in 1868. The city has several mills. Forestry and wine handling are important industries. Pop. 3,758.

COCHERY, kŏsh'rē', **George (Charles Paul)**, French public official: b. Paris 1855. He was the son of Louis Adolphe Cochery, was educated at the Lycée Condorcet and the École Polytechnique. He was successively director in the Department of Posts and Telegraphs, Minister of the Interior, president of the general council of Loiret, and in 1895–98 and in 1909–10 was Minister of Finance. He is a chevalier of the Legion of Honor.

COCHERY, Louis Adolphe, French statesman: b. Paris 1819; d. 1900. He practised law in Paris and became Chief of Cabinet in the Ministry of Justice during the Revolution of 1848. Afterward he was editor of the *Avenir National*, and in 1868 founded *L'Indépendant de Montargis*. He was a member of the legislative assembly and opposed the war with Germany. In 1870 he became general commissioner of the National Defense in the department of Loiret. He was undersecretary of the Department of Finance under Dufaure and was Minister of Posts and Telegraphs in 1878–85. He was elected senator in 1888.

COCHIN, ko-shăn, **Charles Nicolas**, French engraver: b. Paris, 22 Feb. 1715; d. Versailles, 29 April 1790. He was the son of an etcher of note and his productions excelled those of his father. He was chosen engraver to the king (1739) and in this capacity portrayed a number of court subjects. The collection of his works contains more than 1,500 pieces, among which are 112 likenesses, in the form of medals, of the most renowned French scholars and artists of his time, who were among his friends. Besides his essays in the memoirs of the Academy, he published 'Voyage d'Italie' (1758); criticisms on art under the title 'Œuvres diverses'; and also 'Mémoires inédites du Comte de Caylus' (1780). His frontispieces and vignettes are remarkable for neatness and taste. His views of 16 French seaports are of great value. His composition in general is rich, delicate and pleasing. He was a member of the Academy, was ennobled in 1757, and occupied several places of importance. Consult Rocheblave, 'Les Cochins' (Paris 1893).

COCHIN, Henri Denys Benoit Marie, French author and deputy: b. Paris 1854. He received his education at the Lycée Louis-le-Grand, Paris. He served in the Franco-Prussian War 1870–71, became an attaché of the Ministry of the Interior and after 1893 served continuously in the Chambre des Deputés. He was chosen member of the Academy in 1911. He has published 'Giulietta et Romeo' (1878); 'Le manuscrit de M. Larsonnier' (1880); 'Boccace' (1890); 'Un ami de Pétrarque' (1892); 'Chronologie du Canzonière de Pétrarque' (1898); 'Le frère de Pétrarque' (1903); 'La vita nuova de Dante traduite et commentée' (1908); 'Tableaux flamands' (1909); 'Jubilis d'Italie' (1910); 'Lamartine et la Flandre' (1912); 'Ozanam: livre du centenaire' (1913); 'Descartes' (1913).

COCHIN, kō-chēn, India, seaport of Hindustan, in the Malabar district of the Madras presidency, situated on the coast. It is a picturesque place with many quaint old Dutch buildings. Its harbor, though sometimes inaccessible during the southwestern monsoon, is the best on this coast. It is the chief port on the Malabar coast, and ranks third in importance in the Madras presidency. Cochin was one of the first places in India visited by Europeans. It was visited by Cabral in 1500; in 1502 Vasco da Gama established a factory; in 1503 Albuquerque built a fort, and here he died in 1524. In 1530 Saint Francis Xavier visited the seaport, and made many converts. In 1663 the Dutch took the place; in 1795 it fell permanently into British possession. Pop. 20,023.

COCHIN, a variety of the domestic fowl, imported from Cochin-China. It is a large, ungainly bird, valuable chiefly owing to its fecundity, eggs being laid even during the winter. They are brown, black, buff or variegated in color, and except in the black variety have yellow-feathered legs and single erect combs.

COCHIN-CHINA, a country forming part of the peninsula of southeastern Asia, and generally regarded as comprising the whole of Anam and Lower or French Cochin-China. Three of the six provinces into which the latter was divided were acquired at one period, and the remaining three at another period. A persecution of the French Roman Catholic missionaries in Anam furnished the French with an occasion of regaining a footing in the East. An expedition against Cochin-China was decided on in 1857, and Saigon was occupied. The Austro-Italian War deferred further operations till 1861, when the conquest of Metho gave the French possession of the most fertile district of Lower Cochin-China. The war continued till 5 June 1862, when a peace was concluded at Saigon with the king of Anam, which was ratified at Hué 15 April 1863. By this treaty the king agreed to cede to the French the three provinces of Bienhoa, Saigon and Metho, along with the island of Pulo Condore, to tolerate the Roman Catholic religion, to open three of the ports in Tonquin to French ships, and to pay an indemnity of 24,000,000 francs (about $4,800,000). Although the inhabitants were found to be on the whole sufficiently tractable, yet a few revolts took place, whereupon Admiral De la Grandière, on the pretext that all these disturbances had their origin in the provinces of Lower Cochin-China which had remained to Anam, namely, Vinhlong, Chaudoc and Hatien, took possession of these provinces, and declared them French territory, 25 June 1867. The territory thus acquired by France in this peninsula covers 21,980 square miles, and in 1915 had a population of 3,050,785. It is now organized in departments, prefectures, sub-prefectures and cantons. In 1882-83 France asserted a claim to the protection of Tonquin, and indeed the entire Anam territory, and after some fighting this claim was conceded by the king. Tonquin was accordingly taken possession of by France in 1884. Anam (q.v.) forms a protectorate. In 1888 it became part of the governor-generalship of Indo-China, is under the administration of a lieutenant-governor, and is represented by a deputy in the French chamber. Anamese troops served under French leadership in the Allied campaign in the Balkans in 1916.

The northern and eastern parts of French Cochin-China are hilly, but the rest of the territory consists almost entirely of well-watered low alluvial land, and from the deposits brought down by the rivers, of extraordinary fertility. The lowlands, where the waters stagnate, are covered with a rank vegetation from 3 to 10 feet high; contiguous to the flowing streams are extensive rice-grounds. Where the soil is somewhat raised above the water-level it is very fertile, and in some places ranges of low hills follow the line of the rivers. In the more elevated districts are grown tobacco, sugarcane, maize, indigo and betel. Among the other products are tea, gums, cocoanut oil, silk, spices and various farinaceous and aromatic articles. The Anamites raise also great numbers of buffaloes, cattle, hogs and birds, the first being employed in agriculture, and, as well as oxen, for draft purposes; but since the French conquest, oxen are reserved more strictly for food. Industrial arts are as yet limited among the natives. They are skilful in all kinds of basket-work, in which they use the reeds and other similar materials which abound in the low lands; silk and cotton are also wrought. But they excel in the use of wood, of which their temples, pagodas and tombs are built, and ornamented with elaborate carving. They live in villages — numbering nearly 1,000 — adjacent to the rivers, which, in the unsuitableness of the country for land traffic, form almost the only means of communication. Their houses are either tiled or thatched with straw, the roofs being supported with wooden pillars; the better class are in two sections, the inner apartments and the outer veranda, which serves for use in the daytime; they are often well furnished, and not devoid of comfort. The only roads at present are those connecting Saigon, the capital (pop. 1915, 100,000, with 11,250 white) with the principal towns. The most populous city is Cholon, with 191,655 inhabitants. There are 2,670 miles of telegraph in operation. The climate is humid and warm, and very trying for Europeans. The prevailing religion is Buddhism. There are some 600 schools in the territories. The principal export is rice, of which there is annually exported about 7,000,000 hundredweight, mainly to China; cotton and silk are also exported.

COCHIN-CHINA, Upper, or **DONG-TRONG,** a narrow strip of land, consisting of four provinces, on the east coast of Anam, to which empire it belongs, extending from Tonquin on the north to Champa on the south. The most important river is that on which the chief town, P'hu-thua-thien or Hué, stands. In the most fruitful parts of this region aloes wood (of the Aquilaria ovata), corn, sugarcane and cinnamon flourish. From October to January the weather is often very stormy, and typhoons rage frequently. The climate is healthy and pleasant. Camphor is produced in the district in the utmost perfection.

COCHINEAL, koch'ĭ-nēl, one of the scale insects (*Coccus cacti*), used as a dye. It is a native of Mexico, but has been introduced into Europe, Algiers, and the Canary Islands, where the plantations of cactus were cultivated for their nourishment. It is a small insect with the body wrinkled transversely; its abdomen of a deep mulberry color, and bristly in the posterior part; the legs are short and black. The principal district in which they are now reared is in the province of Oaxaca, those of the district of Mestique being considered the best insects. There are plantations of the nopal (*Opuntia ciccinellifera*), upon which they feed, the insects being tended with care equal to that ordinarily bestowed upon silkworms. Before the rainy season sets in, branches of the nopal covered with insects are cut off and brought under shelter to protect them from the weather. At the close of the wet season, about the middle of October, the plantations are stocked from these supplies by suspending little nests made of some soft woody fibre, each containing 8 or 10 females, upon the spines of the nopal. The insects, warmed by the sun, soon emerge and lay their eggs, each female producing more than 1,000 young. These spread rapidly over the plants, and as the young females become impregnated they attach themselves to the leaves and swell to great size, presenting the appearance more of vegetable excrescences than of animated creatures. In this condition they are gathered for the cochineal. The males, which are few in number, not more than 1 to 100 or 200 females, are of no value for this purpose. The females are picked off with a blunt knife, the first crop about the middle of December, and subsequently several more of as many successive generations, the last being in May. A laborer can pick off in a day only about enough to make two ounces of cochineal. Those taken off full of young lose about two-thirds of their weight in the process of drying, to which they are subjected as soon as they are killed, which is done either by dipping them in a basket into boiling water, or placing them in a hot oven, or on plates of hot iron. By the first method, usually considered the best, the insects turn to a brownish red color, losing a portion of the white powder with which they were previously loaded between the wrinkles of the body. In the oven they retain this, and their color is then gray. Those killed on hot iron turn black. Such is the origin of the different varieties known in our market as «silver grains and black grains,» and the «foxy» of the London market, the last being those killed by boiling water, though others ascribe it to the former being the female before laying her eggs, and the latter after she has parted from them. The quality of the cochineal is the same in both cases. When dried, the cochineal presents the form of grains, convex on one side and concave on the other, about one-eighth of an inch in diameter, with the transverse wrinkles still visible. It is stated that it takes about 70,000 insects to weigh a pound. The market value of cochineal has declined so much since the introduction of coal-tar dyes that the cultivation of the insects has been abandoned elsewhere than in Mexico, and comparatively little of this dye is now produced even there. See SCALE INSECTS.

COCHINEAL-FIG, a name given to *Nopalea coccinellifera* and several other species of cacti, natives of Mexico and the West Indies, the plants on which the cochineal insect lives. See CACTUS; COCHINEAL.

COCHITUATE, kō-chĭt'ū-āt, **LAKE,** Mass., a narrow body of water, about four miles long, in Middlesex County, 17 miles west of Boston. From this lake for many years Boston has derived its principal water-supply.

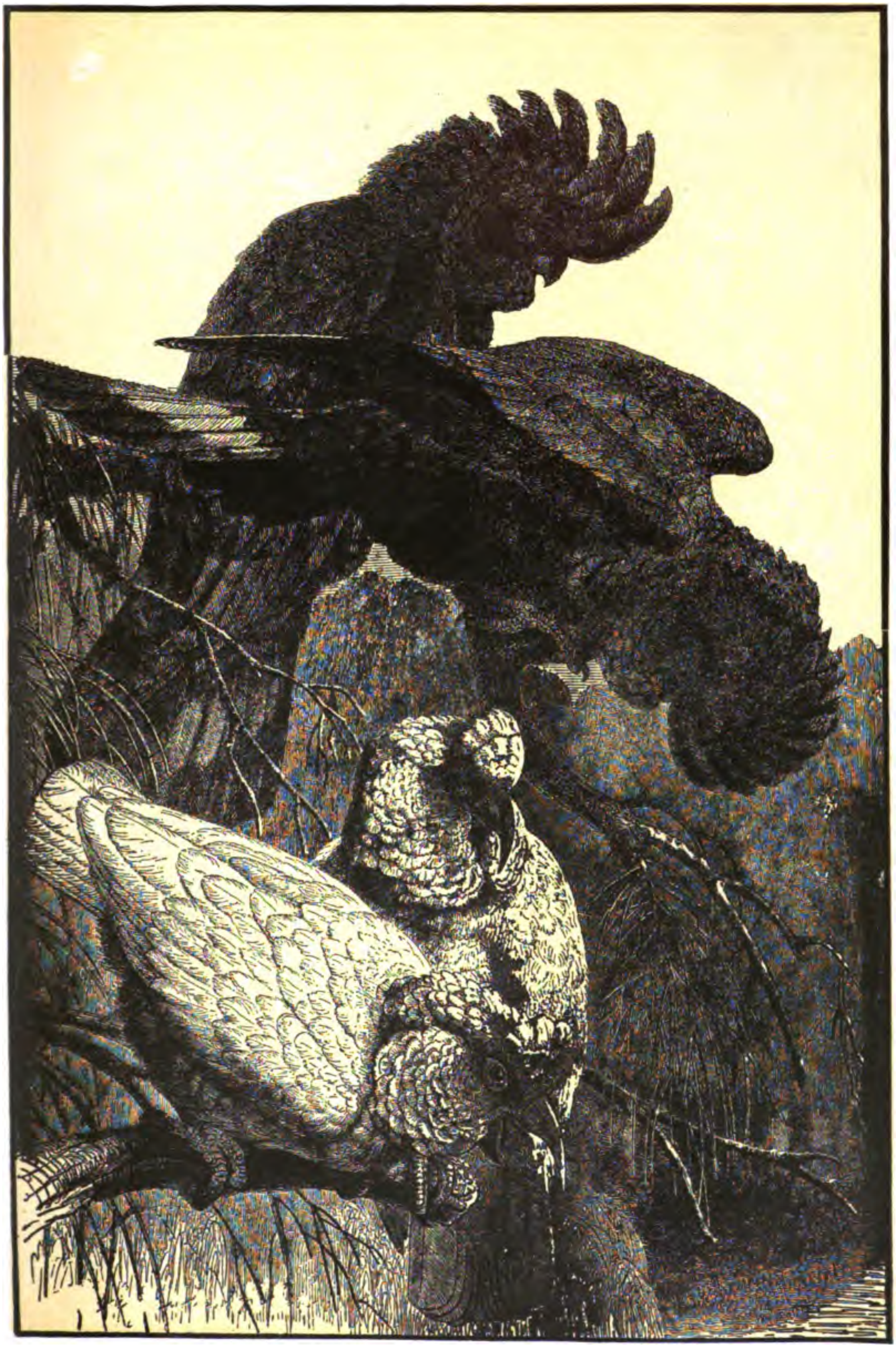
COCHLEA, kŏk-lē'ạ, an important part of the internal ear, so called from its shape, which resembles that of a snail-shell. See EAR.

COCHLEARIA, kŏk-lẹ-ā'rĭ-ạ, a genus of annual maritime herbs of the mustard family (*Cruciferæ*). It numbers upward of 25 species, all natives of the colder parts of the north temperate zone, and not familiar generally. About four species are found on the Arctic and northern Pacific coasts of North America. Two very distinct species quite well known are the horse-radish (*C. armoracia*), escaped from cultivation, and now found wild in the moist ground along streams, and scurvy-grass (*C. officinalis*), considered of great value as an anti-scorbutic. If eaten fresh, it is a stimulant and diuretic, but is feeble if allowed to dry before being taken.

COCHRAN, kok'ran, **John,** American soldier and lawyer: b. Palatine, Montgomery County, N. Y., 27 Aug. 1813; d. New York, 7 Feb. 1898. He was graduated at Hamilton College 1831, practised law in Oswego from 1834 to 1845, when he removed to New York, where his talents as lawyer and orator at once brought him into prominence. He was surveyor of the port of New York 1853–57, and a Democratic member of Congress 1857–61, serving as chairman of the Committee on Commerce. During the Civil War he commanded the 1st United States Chasseurs in the Peninsula campaign; was commissioned a brigadier-general 17 July 1862, and commanded a brigade in General Couch's division of the Army of the Potomac; was with the reserve at the battle of Antietam and took an active part in the pursuit of the enemy. He was attorney-general of New York State 1863–65. In 1864 he was nominated on the Fremont ticket for the Vice-Presidency. He was active in securing Greeley's nomination for President in 1872; was president of the New York common council 1872, and acting mayor when Mayor Hall retired during the Tweed ring disclosures; again a member of the council in 1883, and a police justice 1889.

COCHRANE, Frank, Canadian statesman: b. Clarenceville, Quebec province, 18 Nov. 1852, and educated in the academy of his home town. He was for several years mayor of Sudbury, Ontario, in which town he had a hardware business and became interested in mining, lumbering and industrial ventures. He was returned for East Nipissing in the Conservative interest to the provincial legislature of Ontario in 1905, becoming Minister of Lands and Mines in the Whitney Cabinet. At the general election of 1908 he was returned M.P. to the Dominion Parliament, and on the defeat of the Laurier administration in 1911 accepted the portfolio

COCKATOOS (Cacatuinæ)



1 The Slender-billed Cockatoo (Licmetis nasicus)　　2 The Black or Crow Cockatoo (Calyptorhynchus galeatus)

of Railways and Canals in the Borden government.

COCHRANE, Thomas, 10th Earl of Dundonald, British naval officer: b. Annsfield, Scotland, 14 Dec. 1775; d. Kensington, England, 31 Oct. 1860. While still a boy he was enrolled in the navy, and gained the rank of captain. He entered Parliament in 1806. He was noted for his attacks on naval abuses by which he himself profited. In 1814 he was accused of conspiring to circulate a false report of Napoleon's death for speculative ends, and though he protested his innocence he was imprisoned for a year, fined and was expelled from the navy and the House of Commons. In 1818 he accepted an invitation to organize the navy of Chile and performed many brave exploits during the contest with Spain. He left the service of the Chileans and was commander of the Brazilian navy from 1823 to 1825, when he resigned, because accused of insubordination. In 1827 and 1828 he commanded the Greek army. In 1832 he was cleared of the charges brought against him in 1814, and restored to the Order of the Bath and to the English navy. He was appointed vice-admiral in 1841; admiral in 1851, and rear-admiral of the United Kingdom in 1854. He was of an inventive turn also, and took out patents for lamps to burn oil of tar, for the propulsion of ships at sea, for facilitating excavations, mining, sinking; and as early as 1843 was an advocate of steam and screw propellors in warships. He was exceedingly daring, but his irascible temper and hastiness caused him unnecessary misfortunes. His son published a ‘Life’ based on his ‘Autobiography of a Seaman’ (1860–61).

COCHRANE, Canada, town in the Timiskaming district of Ontario, 500 miles north of Toronto, on the Transcontinental and the Timiskaming and Northern Ontario railways. It has a custom-house and is the trading centre for northern Ontario and northern Quebec and is an outfitting point for miners, trappers and hunters. There are repair shops of both railways here, and the town has electric lighting and power, water and sewerage systems. Pop. 1,715.

COCK. See POULTRY.

COCK LANE GHOST, a famous hoax by which many people of London were deceived in 1762, arising from certain knockings heard in the house of a Mr. Parsons, in Cock lane. Dr. Johnson was among those who believed in the supernatural character of the manifestations; but it was found out that the knockings were produced by a girl employed by Parsons, for the purpose of haunting Mr. Kent, a former resident whose wife had died. Her ghost was supposed to accuse him of murder. Consult Lang, ‘Cock Lane and Common Sense’ (London 1894).

COCK OF THE ROCK (*Rupicŏla crocea*), a South American bird of a rich orange color, with a beautiful crest, belonging to the family *Cotingidæ*. The name, or its French equivalent, is also applied to several related species.

COCKADE (Fr. *cocarde*), a plume of cock's feathers, with which the Croats in the service of the French in the 17th century adorned their caps. A bow of colored ribbons was adopted for the cockade in France, which soon became a national emblem and party insignia. During the French Revolution the tricolored cockade — red, white and blue — became the national distinction. National cockades are now to be found over all Europe. In Germany cockades of black, red and gold, after being forbidden in 1832, were again allowed in 1848, and even introduced into the army. Since 1850, however, they have again ceased to be publicly worn. In Italy the former emblem of the party of progress, the green, red and white cockade, was recognized by the government of Piedmont in 1848, and since the formation of the kingdom of Italy it has formed the national cockade. Consult Carter, ‘Cockades: Their History and Significance’ (*Genealogical Magazine*, Vol. III, London 1899); Racinet, ‘Le costume historique’ (Paris 1888).

COCKAIGNE, kŏk-ān', **Land of,** an imaginary land of idleness and plenty, in which the houses were roofed with cake, the rivers ran wine and roasted fowl offered themselves to be eaten. The term was applied in derision to both London and Paris. The corresponding term in English is «lubberland,» and in German «Schlaraffenland.» ‘The Land of Cockaigne’ was the title of a satirical poem written not later than 1300.

COCKATOO, an English rendering of a Malayan name for certain species of birds of the parrot family (*Psittacidæ*). They are comprised in *Cacatua*, and five other genera forming a sub-family, which, besides having some peculiarities of internal anatomy, is distinguished from true parrots by the greater height of the bill, and its being curved from the base, and by the lengthened, broad and rounded tail. The head is also large, and in the true cockatoos is surmounted by a crest of long and pointed pink or yellow feathers, with their tips directed forward, which can be erected and expanded like a fan, or depressed, at the pleasure of the bird. They live on fruits and seeds, insects, larvæ, etc. The true cockatoos are also all of generally whitish plumage, but often finely tinged with red, orange and other colors, or mixed with these colors in more brilliant displays. The cockatoos are confined to the Australian region and the neighboring Malayan Islands, with the exception of a single Philippine species. The sulphur crested cockatoos (*Cacatua sulphurea* and *galerita*) are well-known cage birds which may be taught a few words, but their vocal efforts are chiefly limited to the harsh cry «cockatoo.» Several allied genera are also given this name, as *Calyptorhyncus* and *Microglossus*, both of which are dark.

COCKATRICE, a fabulous serpent or serpent-like monster anciently believed to be hatched from a cock's egg. It is often simply another name for the basilisk (q.v.).

COCKBURN, kō'bėrn, SIR **Alexander James Edmund,** English jurist: b. 24 Dec. 1802; d. 20 Nov. 1880. He studied at Cambridge; was called to the bar in 1829, and soon became distinguished as a pleader before parliamentary committees. In 1847 he became member of Parliament for Southampton in the Liberal interest; became solicitor-general and was knighted in 1850 and attorney-general, 1851–56. He was made chief justice of the common pleas in 1856; and lord chief justice in 1859.

Among the many famous trials over which he presided were the Tichborne case and the Wainwright murder. He represented Great Britain at the Geneva arbitration tribunal for the adjustment of the «Alabama Claims,» 1871–72.

COCKBURN, Alicia or **Alison Rutherford,** Scottish lyrist: b. Fairnalee, Selkirkshire, about 1712; d. Edinburgh, 22 Nov. 1794. In 1731 she married Patrick Cockburn, advocate, and in 1753 was left a widow. She died after having for 60 years and more been one of the queens of Edinburgh society. In person she was said to be not unlike Queen Elizabeth. Of her lyrics the best known is the exquisite version of 'The Flowers of the Forest' («I've seen the smiling of Fortune beguiling»), commemorating a wave of calamity that swept over Ettrick Forest, and first printed in 1765. Mrs. Cockburn in 1777 discerned in Walter Scott «the most extraordinary genius of a boy»; in 1786 she made the acquaintance of Robert Burns.

COCKBURN, Sir **George,** English naval officer: b. London, 22 April 1772; d. Leamington, 19 Aug. 1853. He entered the navy in early youth, and about 1812 obtained the rank of rear-admiral. He took part in the capture of Washington City in 1814, and conveyed Napoleon to Saint Helena in 1815. He was a first naval lord of the Admiralty from 1841–46, and sat in Parliament for many years.

COCKBURN, George Ralph Richardson, Canadian educator: b. Edinburgh, Scotland, 15 Feb. 1834; d. London, Ontario, 17 Jan. 1912. He graduated at Edinburgh University 1857, went to Canada in 1858 and became rector of the Upper Canada Grammar School. In 1861 he was made principal of Upper Canada College, and under his administration of 20 years it attained a high reputation for the excellence of its teaching and discipline.

COCKBURN, Henry Thomas, Lord, Scottish judge: b. Edinburgh, 26 Oct. 1779; d. Bonaly, near Edinburgh, 26 April 1854. It was chiefly in connection with political cases that he rose to eminence in his profession, one leading transaction being his gratuitous defense of several persons tried for treason in the year 1818. He became solicitor-general for Scotland in 1830, and in 1834 one of the lords of session. 'Memorials of His Time' (1856) is an invaluable record of the social history of Scotland, narrated in the raciest and most genial manner. Not less interesting is his life of his friend Lord Jeffrey (1852).

COCKBURN, Sir **John Alexander,** Australian statesman: b. Corsbie, near Duns, Scotland, 23 Aug. 1850. He was educated at Kings' College, London, and settled in South Australia in 1875, was mayor of Jamestown 1877–81; sat in the House of Assembly for Burra 1884–87, and for Mount Barker 1887–98. He was Minister of Education 1885–87; Premier and Chief Secretary 1889–90; Chief Secretary 1892; Minister of Education and Agriculture 1893–98; agent-general for South Australia 1898–1901. He represented South Australia at the International Commercial Congress in Philadelphia in 1899, and other important conferences. He was created K.C.M.G. in 1900.

COCKCHAFER. See Chafer.

COCKER, Edward, English engraver and teacher of writing and arithmetic: b. 1631; d. 1675. He is said to have published 23 books of exercises in penmanship, one of which is preserved in the British Museum. The great work with which his name is so intimately associated that the phrase, «according to Cocker,» has become proverbial, was first published in 1678 under the title of 'Cocker's Arithmetic, Being a Plain and Familiar Method, Suitable to the Meanest Capacity, for the full Understanding of that Incomparable Art, as It is now Taught by the Ablest Schoolmasters in City and Country, Composed by Edward Cocker, late Practitioner in the Arts of Writing, Arithmetic, and Engraving.' The book reached a 37th edition by 1720, and upon it most of the succeeding treatises on arithmetic were based. Two other works bear Cocker's name — a treatise on 'Decimal Arithmetic' and an 'English Dictionary,' but it has been surmised that they are not of his authorship, but of that of his publisher, Hawkins.

COCKER, a variety of spaniel (q.v.).

COCKERELL, kŏk'ĕr ĕl, **Charles Robert,** English architect: b. London, 28 April 1788; d. London, 17 Sept. 1863. He wrote monographs on the mausoleum of Halicarnassus and other archæological subjects. Advancing to the front rank of his profession, he became an associate of the Royal Academy in 1829, a member in 1836 and professor of architecture in 1840, delivering lectures which were highly esteemed and largely attended. He was happier in following classic models than in the Gothic style. He was the designer of the Taylorian building at Oxford, and completed the Fitzwilliam Museum at Cambridge, and Saint George's Hall, Liverpool. He wrote on the 'Iconography of Wells Cathedral'; 'Sculptures of Lincoln and Exeter Cathedrals'; 'Tribute to the Memory of Sir Christopher Wren'; etc.

COCKERELL, Theodore Dru Alison, American zoologist: b. Norwood, England, 22 Aug. 1866. He was educated at the Middlesex Hospital Medical School. In 1887–90 he resided in Colorado, and there studied entomology, botany, etc. In 1891–93 he was curator of the public museum of Kingston, Jamaica, and was professor of entomology at the New Mexico Agricultural Experiment Station 1893–96, and was entomologist there from 1893 to 1901. In 1903–04 he was curator of the Colorado College Museum and since 1904 has been lecturer on biology at the Colorado State Preparatory School. He was also lecturer on entomology 1904–06, professor of systematic zoology 1906–12 and since 1912 professor of zoology at the University of Colorado. He is the author of over 2,500 articles and notes in scientific publications, principally on mollusca, insects, fishes, palæontology and subjects connected with evolution.

COCKERMOUTH, England, town in the county of Cumberland. It is situated at the confluence of the Cocker with the Derwent, 32 miles southwest of Carlisle by rail and 260 miles northwest of London. It has industries in textiles, paper, hats, agricultural implement works and tanneries. Coal mines are in the vicinity. The old castle, supposed to have been built soon after the Conquest, stands on a bold eminence. Mary Queen of Scots was imprisoned in it in 1568, and in 1648 it was dismantled by the parliamentary forces. Cockermouth is the birthplace of the poet Wordsworth, in memory of whom a fine stained-glass window has been inserted in the church of All Saints. Pop. 5,203.

COCKFIGHTING, an ancient sport of unknown origin, but practised among both the Greeks and the Romans. An annual cockfight was instituted at Athens, and Æschines reproaches Timarchus, and Plato the Athenians in general, with their fondness for the cock-pit. The breeds of Rhodes and of Tanagra in Bœotia were in great esteem in Greece. The Romans seem to have used quails and partridges also for this purpose. This sport has long been a favorite with both Americans and English, although repeatedly denounced and prohibited by the laws. The size proper for game-cocks may be said to be not less than four pounds eight ounces, nor above four pounds 10 ounces. The strain from which the cock is chosen ought to be distinguished for victory. For the combat they are armed with steel or silver spurs, or «gaffles.» The place appropriated to fighting is called a «pit,» and consists generally of a mound of earth covered with sod, and surrounded by seats in circular tiers. The battle is conducted by two «setters-to,» who place the cocks beak to beak. When they are once «pitted» (this verb owes its origin to the sport of cockfighting), neither of the setters-to can touch his cock so long as they continue to fight, unless their weapons get entangled. In the Philippine Islands cockfighting is pushed almost to the verge of a craze. Nearly every village has its pit, and every peasant his cock. The peasant, too, is said to rescue his fighting-cock rather than his wife or child in the event of fire, and wherever he goes he takes it with him. The sport is there practised in a very cruel form, and many are ruined by excessive betting. Throughout all Spanish-America cockfighting is more or less in favor. It was formerly a regular sport in the public schools of England, and schoolmasters received dues in connection with it. Cockfighting is still prevalent in China, Persia and Malacca. For early history consult Markham, ‹The Pleasures of Princes or Goodmen's Recreations› (London 1614); Fairfax, ‹Complete Sportsman› (ib. 1764); Blain, ‹Rural Sports› (ib. 1853).

COCKLE (*Cardium*), a genus of bivalve shellfish forming the type of the family *Cardiidæ*. The general characteristics are — shells nearly equilateral and equivalvular; hinge with two teeth, one on each side near the beak, and two larger remote lateral teeth, one on each side; prominent ribs running from the hinge to the edge of the valve. The animal has a powerful foot with which it burrows in the sand. For this purpose it first distends it with water, to give firmness to it. This foot may also be used to enable the animal to move from place to place, for by first bending it and then suddenly straightening it the animal may project itself to a considerable distance. The common cockle (*Cardium edule*) is common all round the coasts of the British islands wherever it finds suitable sand-beds to live in, and is also found in the Baltic, and elsewhere. It is much used as an article of food. A prickly species, the *Cardium aculeatum*, found on the coast of Devon, is also eaten. Among American species, which, however, are not eaten, are *C. islandicum*, found to the north of Cape Cod, and *C. pinnulatum*, found about Long Island Sound. On the coast of Labrador *Serripes groenlandicus* reaches a large size, being nearly four inches long and two inches thick. This genus is represented by fossils from the Devonian Period onward, but it attains its maximum in recent seas. Consult Lovell, ‹Edible Mollusks of Great Britain.›

COCKLE, kŏk'l. See CORN-COCKLE.

COCKLE, Order of the, that of Saint Michael, the knights of which wore the scallop as their badge. This order was instituted by Louis XI of France, who began to reign 1461 A.D. The dress is thus described from a MS. inventory of the robes at Windsor Castle in the reign of Henry VIII: «A mantell of cloth of silver, lyned withe white satten, with scallope sheelles. Item, a hoode of crymsin velvet, embraudeard with scallope shelles, lyned with crymsin satten.»

COCKLEBUR, coarse annual plants, species of *Xanthium*, belonging to the ragweed family (*Ambrosiaceæ*). There are five or more species widely distributed throughout temperate regions. Some of these species occur very commonly in waste grounds in nearly every part of the United States. Wool-growers are seriously troubled by the hook-spined burs of these plants, which catch in the sheep's wool, depreciating its value. In South Africa the injury to the wool industry is so great that strict laws are enforced to keep the plant from multiplying.

COCKNEY, a nickname for a native of London, especially for a person both born and bred there, within the sound of Bow Bells, the term being often used with a certain sense of disparagement and as implying ignorance of other than city affairs, or as suggesting effeminacy. As to the origin of the word there has been much dispute, and many explanations, some of them sufficiently absurd, have been propounded. In the 14th and 15th centuries it was used to mean a petted or cockered child; and, according to the most recent etymology, its original meaning was «cock's egg,» a small or misshapen egg. For an excellent study of the historical explanations of the use of this word, consult Murray, J., ‹New English Dictionary.›

COCKPIT, in old time men-of-war, a place situated under the lower gun-deck, where the ship's surgeons tended the wounded. The term is also applied to the open space in a yacht or canoe in which the crew or passengers sit.

COCKRAN, kŏk'ran, **William Bourke**, American lawyer: b. County Sligo, Ireland, 28 Feb. 1854. He was educated in Ireland and France, receiving his LL.D. from Saint Francis Xavier College in 1887. He came to America in 1871, taught school for several years and became principal of a public school in Westchester County, N. Y. At the same time he studied privately for the bar. He soon attained prominence as a lawyer, and entered actively into New York politics, his eloquence causing him to be much in demand as a Democratic public speaker. He was a member of Congress 1891–95, made noteworthy speeches at the Democratic national conventions of 1884 and 1892, at the latter of which he opposed Cleveland's nomination; and in 1896 refused to follow his party on the silver question, campaigning for McKinley, and advocating the gold-standard in effective addresses. He was re-elected to Congress in 1904 to succeed George B. McClellan, and again for the term 1905–09, after which he resumed his law practice in New York.

COCKRELL, Francis Marion, American senator: b. Johnson County, Mo., 1 Oct. 1834; d. 13 Dec. 1915. He was graduated at Chapel Hill College, Mo., 1853, studied law, and practised that profession until his election to Congress. During the Civil War he was a brigadier-general in the Confederate army, was severely wounded during Hood's invasion of Tennessee, and commanded a division in the operations around Mobile, Ala. He was chosen United States senator to succeed Carl Schurz, took his seat 4 March 1875, and was re-elected four times, his last term expiring 3 March 1905. From 1905–10 he was a member of the Interstate Commerce Commission and in 1911 he was United States Commissioner to readjust the boundary between Texas and New Mexico.

COCKROACH, any of the species of *Blatta* or allied genera, belonging to the family *Blattidæ*, order *Orthoptera*. The body of the cockroach is much flattened, being adapted to life under the bark of trees, under stones, in cracks, etc. The four wings are much alike in size and net-veined; the antennæ are long and slender, and to the end of the body are appended many jointed antenniform limbs which contain olfactory organs like those in the joints of the antennæ. Cockroaches are hatched in nearly the same form as the parent, differing mainly in not having wings. The eggs are deposited in a bean-like case (*oötheca*), which is divided into two compartments, each containing about 30 eggs; these egg-sacs are carried about for some time by the female, projecting from the end of her hind-body. One small native species (*Platymodes pensylvanicus*) lives under stones, but the species so abounding in our homes have been introduced from the Old World. The peculiar odor given out by cockroaches is expelled from glands in the hind-body, and either present in both sexes, or only in the males. In the croton bug or common small cockroach of our cities, these glands are very large, giving out a fœtid odor, and occur only in the males.

While nearly a thousand species of blattids are known to be now living and 200 fossil species are described, mostly from Palæozoic strata, chiefly the carboniferous states, several forms are household pests. They swarm in our kitchens, spreading through those parts of the house warmed by hot water or steam pipes, and are troublesome from eating clothing, cereals, devouring the paste in bindings of books; they also abound in ships, where they devour ship biscuit, etc., impregnating the pantry with their disagreeable odor. On the other hand, the cockroach is an enemy of the bed bug, doing great service in reducing their numbers. The development of the cockroach is slow and the number of eggs deposited not great. *Phyllodromia germanica*, the German roach or croton bug, reaches maturity in from four and a half to six months.

Of the many species known the most annoying is the German roach, whose native country is, however, not known, though supposed to have had an eastern origin. The Oriental cockroach (*Periplaneta orientalis*) is derived from tropical Asia, and is supposed to have been introduced into Europe two or three centuries since. The female is nearly wingless; it is a large dark brown species, living in colonies. The best remedies are insect powder, phosphorus paste, and a proprietary substance called German snowflake powder. Consult the textbooks on entomology; also Howard and Marlatt, 'The Principal Household Insects of the United States' (Bulletin No. 4, U. S. Department of Agriculture, Division of Entomology, Washington 1896); 'Insects Injurious to the Household' (New York 1912).

COCKSCOMB, a name sometimes given the genus *Celosia cristata* of the amaranth family *Amaranthaceæ*. It is an annual plant, natice in the tropical regions of America, Asia and the East Indies. The naturalized plant from tropical America is found during the months of August, September and October as a weed or herb in waste places, also in cultivated ground, throughout the United States. The cultivated plant grows with an upright stem bearing a brilliantly colored and wavy crest, formed by the minute flowers on the surface of the pointed bracts. There are both tall and dwarf forms, and a number of colors of each. See Amaranthus.

COCKSWAIN, or **COXSWAIN,** colloq. kŏk's'n, the officer who manages and steers a boat, and has the command of the boat's crew.

COCKTON, Henry, English humorous novelist: b. London 1807; d. 26 June 1853. His stories were very popular in their day, the most noted among them being 'Valentine Vox, the Ventriloquist' (1840). He wrote also 'Sylvester Sound' (1844); 'The Sisters' (1844); 'The Love Match' (1847).

COCLES, kō'klēz, **Horatius.** See Horatius Cocles.

COCO DE ACEITE (oil cocoa), kō'-kō dā ă-sā'-ē-tā, a nut (and tree) native of Mexico, Central America and the northern part of South America, about the size of a nutmeg and very much like it in appearance. It contains a very edible white kernel much like the meat of a coconut. It is covered by a thin purple pellicle. The oil, which is sweet-scented, very readily congeals, in which condition it is soft and white as snow.

COCO DE MER, or **SEA** or **MALDIVE DOUBLE COCOANUT,** the fruit of the *Lodoicea seychellarum* palm. The fruit weighs 40 to 50 pounds and usually contains four nuts which are 18 inches long and lobed at each end. Before maturing the inside of the nut is soft and edible. The hard black shell is carved into ornaments and the young leaves yield an admirable material for baskets and plaited work; the older leaves for thatching. As a sovereign antidote to poison, and long known only from specimens thrown up on the Maldive coasts by monsoons, it was supposed to grow on a submarine tree, and had other fables attached to it. The tree on which it grows is peculiar to some of the Seychelles Islands, reaches a height of 100 feet and has very large fernlike leaves.

COCOA, or THE CHOCOLATE TREE: derived from the word Cacao, which has the scientific preference in English, from Mexican (Aztec) Caucatl, Cacahuatl, Chocolatl (the suffix «latl» meaning water). The origin of the word is in doubt, being by one authority ascribed to the name of the district — Choco — of its greatest production. Etymologically, however, it would seem to be the name in its doubled or intensive form of the tree from which it is produced, the word «Ca,» among the Central and South American Indians, meaning «the plant,» and, intensified, «Ca-ca-o,» «the plant or plants.» It is analogous to «Yerba Maté,» known to the Guarani Indians as «Caa» — «the plant.» Botanically it bears the name Theobroma — the «Food of the Gods» — so called by Linnæus.

The cocoa tree is indigenous to the subtropical and tropical portions of the Western Hemisphere. It is mentioned by the earliest of the Spanish-American chroniclers — particularly by those who wrote concerning the conquest of Mexico, in which country it was the principal beverage. It is stated (Prescott, and authorities cited by him) that the annual tribute of the royal household of Montezuma included «20 chests of ground chocolate, 80 loads of red chocolate, 200 loads of chocolate, and 800 xicaras,» the vessels from which the prepared beverage was drunk. The same authority states that the royal account book showed annual expenditures for cocoa to the amount of 2,744,000 fanegas (fanega, about 100 pounds). So generally was cocoa used that it constituted a part of the currency of the Aztecs, it being circulated in small bags each containing a specified number of beans.

The tree is a perennial evergreen of the natural order of *Sterculiaceæ, Byttneriaceæ,* thriving in low altitudes and high temperatures from — 80° to 100° F. It is generally found at about 50 feet about sea-level, but recent experiments with cultivated varieties indicate that it may be successfully grown at 1,500 feet above the sea if compensating rainfall and temperature conditions exist. In its wild state the tree attains to a height of about 40 feet, but under cultivation the growth is maintained at from 15 to 20 feet, to the end of producing a fuller developed fruit, for convenience in caring for the tree, and as a safeguard against high winds. At from five to seven feet from the ground the bare stem or trunk divides into several lateral branches, at the juncture of which rises another stem, which, in turn, divides likewise, and so on to the maximum height. The destruction of the perpendicular stem checks the upward growth of the tree. The leaves are large, alternate and undivided, of an oblong-lanceolate or lance ovate, acute shape, and the blossoms are pale-pink, five-petalled clusters growing from the axes of old leaf scars, developing into straight, oblong, cucumber-shaped fruit — about 20 to 30 per tree — with a five- or a ten-furrowed rind. The fruit, or pod — gathered twice every year — is from 5 to 10 inches in length and 3 inches in diameter, and is filled with a sweetish, pulpy mass in which five rows of seeds, or beans, are embedded. These — the cocoa beans — are the part of value in commerce. They are from 0.6 to 1 inch in length, and are covered by a thin, fragile, paper-like skin, within which are the embryo and two oily cotyledonal lobes — the last named being the nourishment for the germinating seed, and the source of cocoa butter.

The preparation of the seed for commerce begins with its removal from the fruit, cleaning, drying and sorting, at which time it has a bitter, astringent taste. It is then subjected to a sweating process by being piled in heaps and covered with green plantain or other leaves, or enclosed in a receptacle and buried for a few days. On extensive plantations these operations are carried on in specially constructed sweating houses, affording every facility for uniformity of treatment. At the end of this operation, a chemical change is noted, resulting in the loss of much of the bitterness and astringency. After the sweating, the seeds are roasted (similar to the roasting of coffee), being then ready for the mill, the operations of which vary in accordance with the ultimately desired form of the cocoa or chocolate. The method ordinarily followed is to break and shell the roasted beans, grind the same with the addition of sugar, starch and flavoring matter, then mold and pack. The various products are: (1) The cocoa shells; (2) cocoa nibs, the broken or partly crushed beans, the simplest state of commercial cocoa; (3) chocolate, the ground cocoa nibs with the addition of sugar, or sugar and starch and flavoring matter; (4) cocoa, the ground cocoa nibs with most of the fat extracted, used as a beverage; and (5) cocoa butter. So indiscriminately are the two terms, cocoa and chocolate, used, that the distinction between the two is in many cases not recognized, but the addition of other elements to the pure cocoa is commercially accepted as producing chocolate. Another form of cocoa is the paste passed through the grinding mill, known as flake cocoa. The usual commercial form of cocoa — known as both rock cocoa or chocolate — consists of cocoa, approximately 44 per cent, sugar 40 per cent, and arrow-root, or other form of starch, 16 per cent. Milk chocolate, so-called, is similar, with the addition of vanilla, cinnamon, or other flavoring extract, and condensed milk, and frequently an extra proportion of cocoa butter.

The oil, fat or cocoa butter (Oleum Theobroma) is separated from the remainder of the bean during the crushing process in a series of horizontal millstones, each succeeding pair being closer set than its predecessor, at a temperature of 200° F. It is soluble in alcohol, melts at 85° and solidifies at 73°. At ordinary temperatures it is brittle, with a smooth and even fracture. Its taste and odor are pleasant, and it is utilized for suppositories and in the making of pomatums, soaps, etc. The shells that are removed from the cocoa bean are possessed of the same theobromic principle as the remainder of the seed, and they, in turn, are pulverized and used as a beverage, similar to tea or coffee. Of the chocolate forms the best known are «simple chocolate,» «iron chocolate,» «vanilla chocolate,» «Iceland moss chocolate,» and others taking their names from certain added ingredients, such as salep, tapioca and sago, with which are also included many medicated forms. As a beverage — by the addition of water or milk, or both — and as a flavoring principle, sweetmeat, and, to a considerable extent, as a food, cocoa or chocolate are well known, their use in the various products of the confectionery industry being universal.

Theobromine, the active principle of cocoa, is an alkaloid, physiologically identical with theine and caffeine, differing, however, in important particulars from either in its operation. While its utilization therapeutically has been negligible, experiments have indicated its availability as a substitute for either of the others mentioned, as likewise of guaranine or cocaine.

While no two varieties of cocoa are the same, a typical analysis of the bean is the following ('Dictionary of Applied Chemistry,' article «Cocoa»):

Moisture	5.23
Fat (cocoa butter)	50.44
Albuminous matter, soluble	6.30
Albuminous matter, insoluble	6.96
Astringent principle	6.71
Gum	2.17
Cellulose	6.40
Alkaloids	0.84
Cocoa red	2.20
Indefinite organic matter, insoluble	5.80
Ash	2.75
Total	100.00

Of the cocoa tree there are many varieties, many of which are of no commercial value. Of these latter, some are utilized as stocks on which to graft less hardy, but commercially valuable, varieties. The most generally cultivated are known as Theobroma cocoa (10-furrowed fruit) and Theobroma pentagona, or Alligator cocoa (5-furrowed fruit). Of the former, the chief classes are the Criollo, Forastero and Calabacillo, each being subdivided into divers varieties. Of the numerous non-commercial varieties cultivated — for grafting purposes — the chief are the Bicolor and Augustifolio, or Monkey cocoa. The tree is produced direct from the seed, or by transplanting and grafting or budding. It begins to bear fruit when three years old, and reaches its full productiveness in its seventh or eighth year, and maintaining it for generations, cases being known of trees retaining their vigor for more than a hundred years. The tree thrives best in a deep alluvial soil covered with a thick layer of humus of decayed vegetation, with a pervious subsoil allowing of about six feet of unobstructed downward root growth. From 150 to 600 trees are planted per acre. Due to the damage caused by tropical storms, other timber is usually planted at a distance as a wind-break, and, while the cocoa plant is young, intermediate rows of coffee, or other trees, or leguminous plants — for soil enrichment — are provided as shelter against the heat of the sun. Constant care is required for the success of a cocoa plantation — pruning, spraying and fertilization with elements furnishing nitrogen, potassium and phosphorus in judicious proportions. On this care depend the healthy tree growth and the development, quality and quantity of fruit. Diseases of the tree and its fruit are numerous, the most destructive being the so-called «Cocoa Disease,» producing dead patches on the cortex of the tree, and the «Cocoa Pod Disease,» a fungus growth of the *Phytophthora omnivora*, both of which spread rapidly and destroy whole plantations. In addition, the cocoa beetle, a longicorn insect, is a destructive pest, boring into the trunk and branches of the tree.

The world's production of cocoa for the year 1905 was — according to the leading cocoa-trade journal, the *Gordian*, of Hamburg — 143,537 metric tons (metric ton, 2,204.6 pounds); in 1915, 283,300 metric tons. The world's consumption for the same two years was, according to the same authority, for 1905, 143,566 metric tons; and for 1915, 294,300 metric tons. The production and consumption for 1915, according to the principal countries, is as follows (from computation of the *Gordian*, republished in United States Commerce Reports 26 May 1916):

Countries	Production, metric tons	Countries	Consumption, metric tons
Gold Coast: Accra	76,022	United States	84,181
Brazil	46,260	Great Britain	47,267
Ecuador	32,834	Germany	43,600
São Thomé	29,598	The Netherlands	40,955
Santo Domingo:		France	31,000
Samana	23,389	Switzerland	11,311
Trinidad	21,808	Spain	6,512
Venezuela	12,250	Austria-Hungary	5,650
Grenada	7,363	Italy	4,093
Lagos	3,900	Belgium	3,800
Fernando Po	3,710	Russia	3,650
Jamaica	3,405	Denmark	2,550
Ceylon	3,251	Norway	1,851
Kamerun	2,250	Canada	1,850
Haiti	2,028	All other	6,000
All other	15,260		
Total	283,328	Total	294,270

Due to the successive rounding off, omitting fractions of tons, the preceding totals are less than the actual figures as elsewhere reported by the same authority.

During the fiscal year ending 30 June 1917, the United States imported 338,653,876 pounds of raw cocoa, valued at $39,834,279, and of prepared cocoa and chocolate (not including confectionery), 1,829,521 pounds, valued at $553,139. During the same year no raw cocoa was exported, but prepared cocoa and chocolate (quantity not given) to the value of $3,451,518 was sold abroad. Consult 'Cocoa Production and Trade' (Department of Commerce and Labor, Washington 1912); 'Cocoa Culture in the West Indies' (published by Agricultural Bureau of German Kali Works, Habana, n.d.); Commerce Reports, Bureau of Foreign and Domestic Commerce, Washington 1914–17.

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COCOA-PLUM, the fruit of *Chrysobalanus icaco*, belonging to the family *Rosaceæ*, which is eaten in the West Indies. It is about the size of a plum, with a sweet and pleasant though somewhat austere pulp. The root, bark and leaves of the plant are employed as remedies in diarrhœa and other troubles. It has simple, alternate leaves and cymose flowers.

COCONUT, or **COCOANUT**, a palm tree (*Cocos nucifera*) probably native of tropical America, but widely distributed in warm countries throughout the world. The tree grows naturally upon sandy soil bordering the sea or not far inland except where planted by man. It is remarkable as one of the first tree species to gain a foothold upon newly formed tropical islands. Its stem, which often attains a height of 100 feet, is crowned by a rosette of long pinnatisect leaves from 10 to 20 feet long, gracefully curving upward at their bases and downward at their tips. From among the bases of the leaf-stems appear large pointed spathes from which proceed yellow or white flowers followed by large hard-shelled nuts. Several of the spathes in various stages of development are usually found upon the trees, which often commence to bear when less than 10 years old and continue productive for more than half a century, yielding about 100 nuts as an annual crop.

Since the tree does not produce well when remote from the coast, it is planted along the shores upon sandy or shelly land where little else of value will grow. The seeds are the sole means of propagation. They are planted in rows in the nursery and when the seedlings are large enough they are transplanted about 20 feet apart, where they are to remain, given clean cultivation for three or four years, and then allowed to shift for themselves, occasional mulches of seaweed, etc., but no manure, being given. The only part of the United States in which the coconut palm bears fruit with reasonable certainty is the extreme south of Florida, but even there it has not become commercially important. It may be taken as an index of the dividing line between the tropical and subtropical regions, since it thrives best in regions where frost never comes.

This palm is one of the most important economic trees of the world. Its fruit is a staple food either ripe or unripe, raw or prepared in various ways, in many tropical countries. It is also exported to temperate climates, where the nuts are used in confectionery and for cake and dessert-making. The oil, of which there is about 70 per cent in the nuts, from which it is obtained by expression or heating in water, is largely used for making soap and candles and for food. (See COCONUT OIL). The central part of the stems of young plants is used for food, as is also the terminal bud or «cabbage.» A drink and a kind of sugar are made from the sap of the young spathes. The dried leaves are used for thatching, baskets, mats, etc., and the petioles for oars. The wood in the lower portions of the trunks of old trees is commercially important under the name of «porcupine wood,» which is used in cabinet-making, etc. The fibrous centres of old stems are used for cordage making, as is also the fibrous husk of the nuts (see COIR). This latter is widely used for making coconut-matting, which is put down in corridors where there is a great deal of tramping. It is exceedingly durable. The coconut shell is used for drinking cups, bottles, etc., and for ornament when carved and polished. The fibre of the husks is used by florists as a moisture-retaining medium in which to plunge potted plants and in which to propagate various seedlings and cuttings.

COCONUT CRAB. See ROBBER PALM.

COCONUT OIL, a solid vegetable fat, largely used in candle making and in the manufacture of soaps and pomatum. This fat is expressed from the albumen of the cocoanut kernel, and is as white as lard, and somewhat firmer. From Manila and Ceylon large quantities of the oil are exported. See COCONUT.

COCOON, kŏ-koon', the pupa case of insects. See SILKWORMS; INSECTS, PUPA.

COCOS, a genus of palms. There are about 55 species, natives of South America, but cultivated for their fruits or for ornament in many warm countries. They vary considerably in height, but are all characterized by absence of spines, ridged trunks, pinnatisect leaves in a terminal crown or rosette, spadices erect at first, but later drooping, spathes two, flowers white or yellow, fruit of various forms. Some species are cultivated under glass on account of their graceful foliage. The most important species of the genus is unquestionably *C. nucifera,* the coco palm or coconut tree (see COCONUT). Of the other species the following are perhaps best known in the United States: *C. flexuosa,* a medium-sized Brazilian species often planted in southern Florida and southern California as a street tree and to some extent cultivated in northern greenhouses. *C. eriospatha,* a stouter, somewhat taller species from southern Brazil, is by some considered the hardiest of the genus and often planted along avenues in the region mentioned and in the West Indies. It is little cultivated under glass because of its rather coarse leaves. *C. datil,* an Argentine species, found to be hardy in southern California as a street tree. Its fruits, which are edible, resemble those of the date palm. *C. plumosa* is the most generally cultivated street tree of the genus; it is of quick growth, soon reaching a height of 30 feet, and, with age, 50 feet. It is indigenous to central Brazil. *C. weddelliana,* a dwarf species from central Brazil, is unquestionably the most popular greenhouse palm, not only of the genus, but of all genera. Its foliage is small, delicate and graceful, and on this account it is frequently used as a table decoration. It is probably the most easily cultivated of the palms used in house decoration, and since it is of slow growth it retains its beauty for a considerable time, never becoming coarse or unattractive.

COCOS, or KEELING, ISLANDS, British India, a group of about 20 small coral islands, lying about 700 miles southwest of Sumatra and 1,200 miles southwest of Singapore, in the Straits Archipelago, being a little horseshoe-shaped cluster of isles lying south of Java at about the distance of a three days' sail by steamer. Estimated population in 1914 was 795. Census population (1911) 794. The inhabitants are divided between the Cocos natives and coolie laborers from Java. The islands have a romantic history. A Scotch sailor named Ross landed here in 1825 and established himself as ruler; in 1851 he hoisted the British flag; but in 1857 the islands were formally annexed to Great Britain, and authority over them still remains in the hands of the Scotch sailor's descendants. An enlightened civil government is maintained; schools have been established; and industries connected with cocoanut and other products are carried on. In 1903, the islands were annexed to the settlement of Singapore in the Straits Settlements.

COCUM-BUTTER, or COCUM-OIL, a pale, greenish-yellow solid oil obtained from the weeds of *Garcinia purpurea,* a tree of the same genus with mangosteen, used in India to adulterate ghee or fluid butter. It is used in some pharmaceutical preparations, in pomatums, etc.

COCYTUS (from Gr. *kōkuein,* to lament), a river of ancient Epirus which falls into the Acheron. Also, among the ancient Greeks, one of the rivers of the lower world.

COD, the typical representative (*Gadus callarias* or *Gadus morrhua*) of a family (*Gadi-*

dæ, q.v.) of marine fishes of pre-eminent economic importance. Although most widely and generally known as the codfish, or simply cod, perhaps not less than 50 other names are applied to it more or less colloquially, many of them derived from the same root as cod. The cod is moderately elongated, heavy in front, with a large head, and tapering gradually into a slender tail terminated by a slightly notched fin. There are three dorsal fins, none of which is elevated, and two anals, and the ventral fins are normal in structure and placed far forward on the throat. The mouth and eyes are large, and the chin bears a long barbel. Very small scales cover the entire body and most of the head. Although varying much in shade, the color is usually reddish-brown with small rounded spots of darker brown and a conspicuous pale lateral line. Unlike the haddock, all the bones of the shoulder girdle are thin and lamellar. There is much variation in size, certain localities and schools always yielding large fish, others small or mixed. An average length is from three to four feet; and the weight from 7 to 40 pounds, but very much larger ones, several exceeding 100 pounds, and one of 160 pounds, have been recorded.

The cod is a cold water fish, preferring a temperature of from 35° to 45°. Whether there is more than a single species is doubtful, though it is well known to fishermen and ichthyologists that the Alaskan cod have much larger swimming-bladders than those of the Atlantic. The cod may be said to have a circumpolar distribution, ranging south in the Atlantic as far as the Bay of Biscay on the European side, and to Cape Hatteras on the American shore. In the Pacific it is abundant in the waters of Alaska and Bering Sea, and occurs on banks off the mouth of the Columbia River. The cod is sometimes found as far north as 80 degrees and probably beyond. Sometimes it enters fresh water, ascending rivers, as it formerly frequently did the Delaware, perhaps in pursuit of food. That any north-and-south migration takes place is doubtful, but seasonal migrations between deep and shallow waters, and irregular ones in search of food, are well known both on our coasts and on those of Europe. Thus Professor Sars has described the so-called «mountains of fish» which annually approach the coast of Norway. North of Cape Cod the fish approach the shores during the summer, and retire, upon the approach of cold weather, to the deeper waters of the off-shore banks, where they are followed by the Gloucester fishermen. On the shores of New Jersey and Virginia no cod are found except during the winter, the shallow waters becoming so warmed in summer that they are driven seaward to the cold Labrador current. Rocky and stony banks, where a rich fauna has congregated at moderate depths to about 120 fathoms, are the favorite resorts of the cod, but considerable numbers are taken down to 250 fathoms on the edges of the outer banks, and the trawl has brought up cod from a depth of 300 fathoms.

The cod devours everything of an animal nature it comes across. Great clams are swallowed in their shells, and, after being digested, the hard parts are regurgitated in such numbers that the sea-bottom over large areas is said to be paved with them. Spawning takes place at moderate depths, but the buoyant eggs rise to the surface, where they float until hatched. On the European coasts the spawning season is in March and April, but with us during the winter. The fecundity of the codfish is truly astounding, not less than 9,100,000 eggs having been estimated to be produced in a single year by a 75-pound fish, while 2,000,000 to 4,000,000 is the average yield of those of ordinary size. The eggs are small, about one-seventeenth of an inch in diameter, and, although buoyant, have no oil globule, as do many other pelagic eggs. They hatch in from 12 days to 3 weeks, and the young fry, which feed on small crustaceans, grow rapidly, becoming about two inches long in four months and about one foot at the end of a year, though the variation in size is very great. That there has been a great decrease in the numbers of cod frequenting the inshore banks is well known, and many suggestions have been made to account therefor. The late Professor Baird connected it with the decrease in the number and size of the schools of herrings, a favorite food of the cod, itself due to the building of dams and other obstructions which have prevented their entrance into the rivers for spawning purposes. In an attempt to overcome this condition the United States Fish Commission has been engaged for several years in collecting and hatching enormous numbers of cod eggs at its Gloucester and Woods Hole stations, with every promise of a considerable degree of ultimate success. During a recent winter, the last season for which statistics are available, no less than 338,000,000 cod eggs were thus handled.

Next to the herring, the cod is the world's most important economic fish. During 1901 the aggregate value of the fresh and salt cod landed at Gloucester and Boston, the two largest shipping points, was nearly $3,000,000, and the total annual value of the cod-fisheries of both sides of the North Atlantic is about $22,000,000.

Some idea of the magnitude of the cod-fishing industry may be gathered from the fact that out of a total population in Newfoundland of 220,000, more than half that number gains its livelihood from it. The Newfoundland cod fisheries are the oldest in America, and a description of the methods pursued there may well represent those of other and younger stations.

The island was discovered, or, granting an earlier discovery by the Northmen, rediscovered, by John Cabot, 24 June 1497. Soon after this event Portuguese, French, Basque and Spanish fishermen established fisheries on its shores. When, in 1583, Sir Humphrey Gilbert took possession of the island in the name of Queen Elizabeth, small English colonies were established along the east coast, and several French on the southern shore. In 1713 the Treaty of Utrecht declared Newfoundland and its dependencies to belong wholly to Great Britain, but reserved to the French a right to fish and cure on parts of the coast, now known as the «French shore,» extending from Cape Saint John on the east to Cape Ray on the southwest. This reserved right has given rise to many complications, but more with respect to the lobster fishery than the cod industry. Of such prominence is the cod in the social economy of the island that the local courts have determined that the word «fish,» if unqualified, must be deemed to mean codfish, which, in the northern and southern coast settlements, is so often used as an equivalent of money as to be called «Newfoundland currency.» It is measured by the quintal of 112 pounds, and in this form pays for food, clothing and medicines, as well as fees for physicians, the clergyman and the lawyer. The fish «flakes» (see below) are so numerous in all the towns, that it would be impossible to guard their contents; so stringent laws have been passed to prevent theft, and the convicted thief is frequently sentenced to several years' imprisonment, though he may take but a single fish.

While Newfoundland craft are to be seen in numbers upon the Grand Banks, during the last few years the crews have confined their operations largely to the waters in the vicinity of the island. Although the cod are somewhat smaller, they are fully as numerous and of excellent quality, while in a good season fish weighing 10 or 12 pounds are frequently caught. The vessels range in size from the schooner, 125 feet long and over 100 tons burden, to the sailboat manned by two men, who cast their lines or set their nets under the lee of the rocky shores perhaps not more than 500 feet from land, for schools of fish are to be found in proximity to the coast as well as 100 miles away from it, depending largely upon the course of the Labrador current, which furnishes their principal food supply. The larger vessels are schooner-rigged, and usually carry two jibs, a mainsail, foresail and main topsail, with sometimes a small jigger extending over the stern, and staysail rigged between the two masts. In addition, they carry a triangular riding-sail to assist in steadying them when at anchor. The larger ones are manned by from 15 to 30 men, provided with lines for deck-fishing as well as with set lines and trap-nets. Each carries its complement of boats. On arriving at a fishing-ground, a part of the crew throw their lines over from the deck, while others bait and put out the set-lines and the trap-nets from the smaller boats, and visit them at regular intervals to gather in the fish, which are taken to the schooner, hastily cleaned, salted and packed in the hold until the «fare» is completed. The captain usually keeps his boat anchored as long as the school which has been «struck» remains. The fish may stay on one feeding-ground four or five days, or perhaps disappear in four or five hours after the vessel has cast anchor. Then the set-lines and nets are taken up, the vessel weighs anchor, and search for another school begins.

In offshore fishing the trap-net is also used in addition to set-lines, and the larger boats occasionally use hand-lines, if the fish bite freely. A very large catch is made, with the set-lines and nets, and the boatmen go out every morning to take out the fish and bait the hooks, perhaps paying another visit in the evening. Upon the return of the men to the home settlement with their boatload of fish, the women and children join them in cleaning the fare, salting it and spreading it on «flakes» to dry. At times the fishing is so good that the men make three and four trips daily to the nets and lines, carrying home a good load on each trip. Then the women and children prepare the fish in order to save time.

The time required to cure the codfish varies from 4 to 10 days according to the weather. With a succession of sunny days, the fare will be thoroughly cured in less than a week, but the fish must be protected against rainy weather, in spite of the salt with which they are rubbed after being cleaned.

The «flakes» are composed of platforms of boughs elevated from 6 to 10 feet above the ground upon scaffolding; and the fish are laid upon the boughs so closely together that at a distance the «flakes» look as if they were covered with pieces of white canvas. Each fish is turned over at least once every 24 hours, in order to cure both sides thoroughly; and when the process is completed the fish is as stiff as a piece of board. No other ingredient except salt is required for the ordinary curing, although some of the cod prepared at the larger settlements are ground into fine particles after being dried, and mixed with a jam made of small berries. This is placed in jars and sold as a preventive of scurvy. The fares secured by the larger vessels remain in their holds until the cargo is completed. On arrival at Saint Johns, or the home port, the cargoes are sold, in a partly cured condition, to the merchants, who finish the preserving process. In buying the fish from the large vessels, as well as from the fishermen in the settlements about the coast, the cod are valued according to their weight, and generally sorted in three different sizes, the largest bringing a proportionately greater price. The merchant, as he is known in Newfoundland, is the large dealer who exports the fish to the tropics and Europe. He buys from both the fishermen and the «planters.» The latter are a sort of middlemen, and usually have «stations» located at different points along the coast. These stations include general stores containing everything required by the fishermen. The people in the vicinity can go to the station and exchange their harvest for what they need at home and the outfit required for fishing, and, if anything is left to their credit, can obtain its equivalent in money. Many of them, however, are usually in debt to the planter, and, in a good year, the surplus remaining after obtaining their necessities goes in payment of the debt of a previous season. The planters also buy schooner loads, and many of them own steamers and sailing vessels which make regular trips around the island, carrying the fish purchased by the planter to the general market at Saint Johns or one of the other large towns.

While the number of cod caught varies considerably according to the season, the average catch is from 1,250,000 to 1,700,000 quintals, the value, of course, depending on the price. Within the last two or three years the revenue from this source has aggregated about $3,000,000. The number of crews engaged in codfishing can only be estimated, owing to the variety of craft and the wide field of their operations. Authorities on the subject, however, estimate that fully 90,000 men are engaged in the fishery each year, and that a fleet of fully 1,000 two-masted vessels, hailing from the island alone, ply upon the nearby waters and on the banks. Practically all of these vessels are home-made, the wood for both hulls and spars being secured from forests in the interior, while the sails and rigging are imported chiefly from England. For a full account of the natural history of the codfish, consult Goode, ‘American Fishes’; and for statistics of the fisheries and other information, the ‘Annual Reports’ of the United States Commissioner of Fish and Fisheries.

COD-LIVER OIL, an oil (*oleum morrhuæ*) obtained from the liver of the common cod (*Gadus callarias*) and allied species. In medicine it is of great use as a nutritive in certain debilitated or wasting conditions, on account of the great ease with which it is absorbed. There are three grades known in commerce, pale or shore, pale-brown or straits and dark-brown or banks, the first being the purest. The oil was formerly, and is still to some extent, obtained by rotting the livers for several months, but most of it is now got by heating the fresh livers with steam after they have been cleaned and have had the gall-bladders removed. Cod-liver oil is prepared now in Norway, the United States, Canada, Newfoundland, Great Britain, Iceland and Russia. The largest quantity and the best quality comes from the Lopoten Isles in Norway. Cod-liver oil consists of about 70 per cent olive, 25 per cent palmitine, small quantities of stearine and glycerides of the lower fatty acids, cholesterine, 0.002 per cent — 0.003 per cent iodine, organic compounds of chlorine, bromine, sulphur and iron, ammonia and its substitution products, certain characteristic bases, certain characteristic organic acids and peculiar pigments, known as lipochromes.

CODAZZI, kō-dät'sē, **Agostino,** Italian engineer: b. near Ferrara 1792; d. Colombia, June 1859. He made several campaigns under Napoleon and afterward distinguished himself as an engineer in South America. He entered the Colombian service with the rank of lieutenant-colonel of artillery, and was employed in making charts and in preparing plans of defense. In 1831 he was appointed by Paez to prepare partial charts of the new republic of Venezuela. This work occupied nearly nine years, and was twice interrupted by military defensive expeditions, in which Codazzi took part. He was rewarded with the rank of colonel. He devoted the years 1838–39 to exploring the wilderness of Guiana and penetrated nearly to the sources of the Orinoco. The important additions to geography which were obtained from this expedition induced the Congress of Venezuela to furnish him means to make public the result of his labors. For this purpose he went to Paris, where his work appeared in 1841, entitled ‘Resumen de la geografia de Venezuela’ accompanied by an extensive chart of Venezuela. Codazzi afterward established a German colony in Venezuela. In 1848 he was employed by the government of Colombia in a topographical survey of that country and made surveys of the Isthmus of Panama.

CODDINGTON, William, New England colonist: b. Boston, Lincolnshire, England; d. Rhode Island, 1 Nov. 1678. He was one of the founders of the colony of Rhode Island. He arrived in Massachusetts in 1630, remained in Boston for several years, but not being able to agree with the authorities of the colony, he removed in 1638 to Aquidneck, or Rhode Island, where he founded a colony to be governed "by the laws of the Lord Jesus Christ." It was soon found necessary to abandon this vague scheme and in 1640 he himself was chosen governor and in 1647 aided in the formation of a regular body of laws. In 1649 he went to England and two years later was made governor of Aquidneck and Conanicut for life. His opponents succeeded in having this revoked and he became a Quaker in 1666. He resumed his governorship in 1674. He published ‘Demonstration of True Love unto the Rulers of Massachusetts’ (1674). Consult ‘William Coddington in Rhode Island Colonial Affairs’ (No. 4 of the Rhode Island Historical Tracts, Providence 1878). He was unable to secure the reception of Rhode Island into the colonial confederacy. In 1674 and 1675 he was again elected governor.

CODE, a term now generally confined to jurisprudence, and used to designate a systematic compilation of law authorized by governmental authority to take the place of prior existing law. It is in this sense applied to the codes of Theodosius, Justinian and Napoleon. The word is used more generally in the United States as applied to a concise, comprehensive, systematic formation and re-enactment of the law, deduced from both its principal sources, the pre-existing statutes and the adjudications of courts as distinguished from compilation of statute law only. Codes such as here described have been adopted and are in use in many States. They are, in the most part, modeled upon the Code of Civil Procedure of New York. The purpose of a code is to simplify methods of legal procedure and to model and bring together in a codified form the confused mass of laws, contradictions, repetitions and disorder which have grown up during a long period of time. Such a codification of law has always been deemed a most difficult task, and though many times agitated in England, it has never been earnestly undertaken, and is not likely to be for some time. The same causes which made such a codification necessary in the time of the Emperor Justinian exist to-day in many countries and in most of the States of the United States. While the *Corpus Juris Civilis*, or body of civil laws, drawn up by Justinian's commission of 10 learned civilians, was the most important and complete of ancient codes up to that time, there had been other compilations under the empire. These compilations had been made by private lawyers, and formed the basis of the *Codex Gregorianus et Hermogenianus*, which in turn were the models for the Imperial codes of Theodosius and Justinian.

The *Codex Theodosianus* was the work of a commission of 16, to whom, in 435 A.D., the Emperor Theodosius entrusted the task of collecting the edicts and constitutions. Published in 438 A.D., it was a work of great importance, and formed the masterpiece on which every later code was based. It was the initiative of a digest of the whole Roman law. In 528 the Emperor Justinian ordered a new collection to be made, and for this purpose appointed 10 commissioners with full power to make such changes as they might deem necessary in the language of the constitution. They were authorized in their compilation to use the codes, Gregorian, Hermogenian and Theodosian and the constitutions, with the understanding that the new code was to supersede the sources from which it had been compiled. The Code Justinian was completed within 14 months, and was subsequently revised to take in new decisions and constitutions of the emperor. The original code was lost. The revised one, which has been preserved, was published in 534. It is divided into 12 books and each book into titles.

Code Napoléon.—The Civil Code of France, in force at the present day, takes its name from the great Napoleon. It was undertaken under the consulship of Napoleon I by the most eminent jurists of France, and was published in 1804. It is the most celebrated of modern codes. The *Code Napoléon* (under which name four other codes of commercial law, criminal law, penal law and the law of procedure, drawn up at the same time, are often included) was a code in the fullest and strictest meaning of the word, in that it was not merely a collection of the law, but was a complete and thorough statement of the law. The need of a codification of the laws of France had been urged by eminent jurists and statesmen for some time before Napoleon took the matter up and carried it through. Previous to the adoption of the *Code Napoléon* there had been some partial codes in France; such as the *Code Henri*, made by Brisson in the reign of Henry III; the *Code Murvillac* or *Michau* under Louis XIII (1629), relating to judicial procedure, and the *Code Louis XV*, by Chaussepierre, containing the ordinances from 1722 to 1740. There were several of these ordinances enacted in the reign of Louis XVI. No decided move was made to bring about a codification of the confused condition of the laws of France for the purpose of shaping them into a homogeneous jurisprudence until the Revolution had cleared the way. By the consular decree, 12 Aug. 1800, a commission was constituted to compare the order which had been followed in the preparation of the projects for a civil code "hitherto published, to determine the plan which the commissioners should think best to adopt, and to discuss the chief principles of civil legislation."

Napoleon, on becoming consul, appointed a commission headed by M. Tronchet, and including Portalis, Bigot de Préameneu and Maleville, to review all previous efforts at codification and to suggest a new plan. In 1801 the commissioners reported a draft for a civil code, which was submitted to the Court of Cassation and other courts of appeal, and with the reports of the judges was finally brought before the Council of State, in which Napoleon (then first consul) presided in person and took part in the discussion as to the terms and scope of the code. The whole revision after much debate was finally adopted under the title of *Les Cinque Codes*, consisting of the Civil Code, distinguished by the name *Code Napoléon*, the Code of Criminal Procedure, Penal Code, the Code of Civil Procedure and the Code of Commerce. The entire work was first published under the title *Code civil des Français*, but Napoleon subsequently had it published as the *Code Napoléon*, as he considered the code one of the crowning glories of his reign. The *Code Napoléon* consists of 2,281 articles. It has been said of this code that it is the product of Roman and customary law, together with the ordinances of the kings and the laws of the Revolution. Although political upheavals have caused some changes and modifications, the code remains virtually the same as when it left the hands of its framers. The extent of its influence upon the laws of other countries has been very great, as it formed the basis of the codes of the two Sicilies (1819), the Netherlands in 1837, the Swiss cantons from 1819 to 1855, Bolivia in 1843 and the Civil Code of the State of Louisiana.

Code Frédéric.—This is a revision of the Prussian laws, published by Frederick the Great 1749–51, and revised after 1780, but not in force until 1794, was intended, according to its preface, to obviate the difficulties of the Roman codes, the disputes of the commentators and the contradictions between Roman and German law. It has been subjected to many changes.

Codes in the United States.—The first important experiment with a code in the United States was made in Louisiana, which State, originally a French colony, afterward ceded to Spain, again returned to France, and subsequently acquired by the United States from France, has had many changes of law. After the United States acquired Louisiana there arose a strong demand for a code, owing to the great confusion of laws. In 1806–08 a code was adopted, but only to supersede the ancient laws when they conflicted with it. A complete civil code was adopted for the State in 1824, which had for its basis the *Code Napoléon*, although some provisions of the common law were injected into it.

The most important code ever undertaken in the United States is the one which was prepared for the State of New York many years ago under the guidance and supervision of David Dudley Field. This code, although published, and having formed the foundation for many of the codes adopted by the various States, was never accepted by the legislature of New York. As early as 1839 David Dudley Field advocated and urged the adoption of a code by that State. The revised constitution of New York (1846) ordered the appointment of two commissions: one to reduce into a system the whole law of the State, the other to revise and simplify the rules of pleading. Both commissions were appointed by the legislature in 1847. The commissioners to revise and simplify pleadings and practice made a report on 27 Feb. 1848, which contained an incomplete code of civil procedure and practice in the courts of record. This report was immediately adopted by the legislature, but the complete codes of civil and criminal procedure were never adopted. On 6 April 1857 the legislature created a new commission to prepare codes. The commissioners named were David Dudley Field, William Curtis Noyes and Alexander W. Bradford. After some eight years they reported a code — or rather three codes — which was never adopted, although reported favorably by the committees of several legislatures.

The code of civil procedure of the David Dudley Field commission formed the foundation, and was largely adopted in the codes of Ohio, Indiana, Missouri, Wisconsin, Iowa, Minnesota, Kansas, Nebraska, Nevada, California, Oregon, North Carolina, South Carolina, Washington, Montana, Alabama, the Dakotas, Wyoming, Utah and Arizona, and it is the basis of the present codes of civil and criminal procedure in the State of New York, which are codes of practice and pleading, as distinguished from a code of substantive law. The principal feature of the Code of Civil Procedure as adopted by these States was the fusion of law and equity and the simplifying of the written pleadings.

Lewis P. Clover.

CODE, International. A code of international law was published in 1910 by the International Code Publishing Company of New York, having the unusual page arrangement of parallel statements in three languages — English, French and Italian. The author is Jerome Internoscia of Montreal, a member of the bar of the province of Quebec, Canada.

For the ideas and rules which the work contains, Mr. Internoscia acknowledges his indebtedness to the laws, treaties and treatises that have been published in the three languages. By law he means "the highest type of law, the Law of Nations, the International Law, which includes in itself all the other laws of mankind." He believes that the principles of the present international law are faulty, because they declare illegal "the doing of anything that tends to improve the municipal law of nations." He believes that international law, as it is, disregards the fundamental principle of every sound law, namely, that there must be an authority to judge who is right and who is wrong. It does so because of the mistaken idea that, to be independent, a state must have nobody to judge its actions, although it may have many neighbors who for selfish ends deem themselves free to regard as wrong its good actions and, for that reason only, make war upon, and destroy or annex it. To become what it should be, the author contends, international law must be remodeled after the type of a perfect municipal law and attain the perfection of the law of nature. As in nature there is a supreme authority or force, so nations must have a supreme authority or force that will compel the different states to observe the law. The question, therefore, which the author propounds and aims to answer in this work is whether nations can find or create a supreme authority to enforce international law. His answer is that they can.

The ideal of peace, he finds in the aspiration toward a new organization of the Community of States, an organization in which all the controversies between state and state must, without exception, be solved by judicial means provided for that purpose — namely, an adequate body of laws, magistrates to apply them, punishments for infringers and a regular force sufficient to inflict the punishment that any state may incur.

About one-third of Mr. Internoscia's 'Code' contains innovations. First and most important of these is the abolition of war, which is replaced by the forced execution of judgments and, therefore, by an International Procedure, which, while having a scientific basis, he deems complete and eminently practical.

The first part of this 'Code,' treating of public international law, fixes the rights that states must recognize, respect and even protect in man, and establishes to what extent every nation expects its own citizens to do their duty in order to secure peace and happiness for all. A very marked change in the field of international criminal law is a crusade against capital punishment and against crime in general. This 'Code' is opposed to capital punishment, as it is to war, because these are nothing better than murder and manslaughter, permitted by some temporary law. Mr. Internoscia argues that no man can give back life to a dead body, so no law can give to a person the right to take away the life of another.

This 'Code' does not suggest the creation of a worldwide empire, or a confederation of all nations, because, in that case, no nation would be free, and the central power would treat, not as belligerents but as rebels, the inhabitants of any portion who might fight for freedom of action.

The second part of this 'Code' is intended to solve all possible conflicts of the different laws, by fixing rules that are most reasonable and practicable. This part is divided into two books, the first for conflicts in civil law and the second for conflicts in commercial law. All questions of procedure and of jurisdiction — formalities, proof, judgment and executions — are treated in the third part of the 'Code.'

This is the largest code ever written. Most interesting and fundamental is the author's proposed system of courts of international jurisdiction. The novelty of their organization lies in the fact that they are adjuncts or offshoots of one great international tribunal. The judges of such courts are at the same time the clerks, under-secretaries, secretaries and counsels of the international representatives who will constitute an international assembly, which will be the highest international legislature and court.

CODE OF KHAMMURABI. See Hammurabi, Code of.

CODE NAPOLÉON. See Code.

CODEINE, CODEIN, CODEINA, or **CODEIA** (Gr. *κωδεια*, "poppy-head"), a vegetable alkaloid closely allied to morphine and constituting about 0.5 per cent of the weight of opium. Codeine has the formula $C_{17}H_{18}(CH_3)NO_3+H_2O$, and is known to the chemist as methylmorphine, since it is derived from morphine by substituting methyl (CH_3) for one atom of the hydrogen that morphine contains. Codeine may be prepared by adding calcium chloride to an aqueous extract of opium and evaporating to the point of crystallization. The hydrochlorides of morphine and codeine which are obtained in this manner are dissolved in water, and the morphine is precipitated by the addition of ammonia. Codeine hydrochloride remains in solution and may be obtained by evaporation and crystallization, and further purified by recrystallization from ether. Codeine acts as a strong base, and its solution reddens litmus paper, neutralizes acids and precipitates solutions of lead, iron and copper. From aqueous solution it is deposited in the form of trimetric crystals, as indicated by the formula given above. Crystals free from water may be obtained by deposition from a solution in carbon disulphide. When treated with strong sulphuric acid and a small quantity of ferric chloride ($FeCl_3$), codeine compounds give an intense blue color. This reaction is of great value in testing for the presence of the alkaloid. Codeine is used in medicine as a narcotic and hypnotic. Its properties are very similar to those of morphine, but by reason of the methyl groups introduced it has more action on the spinal cord than morphine has. It thus does not cause sleep or relieve pain as readily as morphine, and causes more reflex excitability. It may even cause convulsions in children. It is valuable where a milder sedative than morphine is desired, as there is less euphoria produced and less likelihood of forming a habit. Its use is not free from danger, however, and very small doses have been known to prove fatal.

CODEX, with the ancients, the trunk of a tree stripped of the bark. Before the invention of paper, wooden tablets covered with wax, which were written on with the style and put together in the shape of a book, were called codex. The word was afterward retained, in times when paper was used for writing, to denote a large book. Thus important works, particularly old manuscripts of poets, historians, etc., which had been preserved, were called *codices manuscripti.* In like manner a collection of laws was called codex, with the addition of the name of the sovereign under whom, or of the person by whom, it had been compiled, as *Codex Gregorianus, Codex Theodosianus, Codex Carolinus. Codex rescriptus* (Latin, a rewritten codex) is the name given to ancient manuscripts, which, in the Middle Ages, were used, after the original writing had been in a great measure effaced, for the copying of other works, generally ecclesiastical treatises. Thus the 'Institutions of Gaius,' discovered by Niebuhr at Verona in 1816, and published by Göschen in 1821, is a *codex rescriptus.* Some skill is required to read the ancient letters under the others. The Greek name for *codex rescriptus* is *palimpsest,* now more frequently used. The biblical writings themselves have been sometimes effaced to make way for homilies and legends. One of the oldest manuscripts of the New Testament, designated by the letter C, is a *codex rescriptus,* on which the works of Ephraem Syrus have been written. (See BOOK; BIBLE; PALEOGRAPHY; PALIMPSEST). Consult Scrivener, F. H. A., 'Introduction to the Textual Criticism of the New Testament' (London 1894); Gregory, 'Textkritik des neuen Testaments' (Leipzig 1900); Birt, 'Das antike Buchwesen'; Wattenbach, 'Paläographie' (Leipzig 1877–78).

CODEX ARGENTEUS. See GOTHIC LITERATURE.

CODEX SINAITICUS, sī-nā-ĭt'ĭ-kŭs, a very ancient and valuable manuscript of the Greek Septuagint version of the Old Testament (including the Apocrypha), the whole of the New Testament, the Epistle of Barnabas, and a part of the Shepherd of Hermas, discovered in the monastery of Saint Catherine, on Mount Sinai, by the German scholar Tischendorf, 4 Feb. 1859, while traveling in the East by the desire of the Tsar Alexander II. When the discovery was made Tischendorf endeavored to persuade the monks to make a present of the manuscript to the Tsar, and although he was not immediately successful, he was allowed to take it to Saint Petersburg on loan. Ultimately, in 1869, the manuscript was formally presented to the Tsar as Tischendorf had desired. In 1860 an account of the manuscript was published by the discoverer at Leipzig. It is written on parchment in four columns, in early unical characters, and bears every mark of possessing great antiquity, perhaps being even older than the Vatican manuscript, which, before the discovery of the Sinaitic manuscript, was recognized as the oldest known manuscript of the Old and New Testaments. It is assigned by Tischendorf himself to the 4th century. The Old Testament in this manuscript is defective, but the New Testament is complete, not a word being wanting, which is the more remarkable, inasmuch as it is the only manuscript of the New Testament which is complete. From this circumstance, as well as from its great age, it acquires a value in relation to the text of the New Testament, which can scarcely be overestimated. Two gaps in the Old Testament part of the manuscript are curiously supplied by another manuscript which Tischendorf had discovered in the same monastery in 1844, and which he had brought to Germany and named *Codex Friderico-Augustanus,* in honor of the king of Saxony. From this coincidence, as well as the general resemblance of the two manuscripts, it is inferred that the last-named manuscript is really a part of the Codex Sinaiticus, which is generally believed to be the case. A splendid facsimile of the manuscript was published by Tischendorf under the auspices of the Tsar at Saint Petersburg, in four volumes folio, toward the end of 1862. This was followed in 1863–64 by two smaller editions of the New Testament part of it.

CODEX VATICANUS. See BIBLE.

CODICIL, an addition to, qualification of or change in a will. It must be in the same form as a will, and be executed with the same formalities. All the laws applying to wills apply to a codicil. A codicil properly executed is a republication of the will and makes the will speak from the date of the codicil. The will and codicil are read together as one instrument. There may be more than one codicil to a will; and where there are several, if the last one is properly executed, referring to a former paper in such a manner as to identify it, that paper, although not properly executed, may be read into the will. See WILL.

CODMAN, John, American sea-captain and miscellaneous writer: b. Dorchester, Mass., 1814; d. Boston, 6 April 1900. He was the author of 'Sailor's Life and Sailor's Yarns' (1847); 'The Mormon Country' (1876); 'Round Trip by Way of Panama, etc.' (1879); 'Winter Sketches from the Saddle' (1888).

CODOGNO, kō-dōn'yō, Italy, a town in a fertile district between the Po and Adda, 15 miles southeast of Lodi. It has a large trade in Parmesan cheese and wheat, and carries on a number of manufactures. The French defeated the Austrians here in 1796. Pop. 10,033.

CODRINGTON, SIR Edward, English admiral: b. 27 April 1770; d. London, 28 April 1851. He entered the navy as midshipman in 1783, becoming captain in 1794. He served at the battle of Trafalgar, took part in the Walcheren expedition and was afterward actively employed both in the Peninsular War and the War of 1812. In 1825 he became vice-admiral. His name is principally famous in connection with the battle of Navarino, where he commanded the united squadrons that overthrew the Turkish fleet in 1827.

CODRINGTON, Sir William John, English military officer: b. 1804; d. 1884. He entered the army in 1821, commanded a brigade at the Alma and at Inkerman in the Crimean War, and in 1855 succeeded Sir James Simpson as commander-in-chief in the Crimea. He was elected to Parliament in 1857, was governor of Gibraltar 1859–65, having reached the rank of general in 1863.

CODRUS, the 17th and last king of Athens. Tradition tells that during his reign Attica was attacked by the Dorians, or, according to some, by the inhabitants of the Peloponnesus, or the Thracians. The assailants, inquiring of an oracle what would be the result of their incursion, received for answer that they would be successful if they avoided killing the Athenian king. Codrus, becoming acquainted with this answer, resolved to sacrifice himself for his country. He disguised himself in a peasant's dress, entered the enemy's camp, provoked a quarrel with the soldiers and was slain. The Athenians, upon hearing of this, sent a herald to demand the body of their king. The courage of the assailants was so dampened that they retired without striking a blow. In honor of their patriotic monarch the Athenians abolished the royal dignity, substituting that of a responsible archon, esteeming no one worthy to be the successor of Codrus. They also used his name as a common term to express a man of distinguished excellence.

CODY, Henry John, Canadian preacher and educator: b. Embro, Ontario, 6 Dec. 1868. He was educated at Galt Collegiate Institute and Toronto University, where he graduated in 1889. He was ordained deacon in 1893 and priest in the following year. After teaching in Ridley College, Saint Catharines, he became professor of Old Testament Exegesis and church history, Wycliffe College, Toronto, 1894–99, and afterward professor of systematic theology; was acting rector of Saint Paul's Church, Toronto, 1899–1907, after which date he became rector. He became a canon of Saint Alban's Cathedral, Toronto, in 1903, was an unsuccessful candidate for the bishopric of Toronto in 1909, and in the same year was appointed archdeacon of York. He was one of the founders of Havergal Ladies' College, Toronto. Possessed of exceptional pulpit gifts and of wide learning, he is one of the outstanding men in the Low Church or evangelical school in his communion.

CODY, William Frederick, American scout, hunter and showman, best known as «Buffalo Bill»: b. Scott County, Iowa, 26 Feb. 1846; d. Denver, Colo., 10 Jan. 1917. His parents moved to the country about Fort Leavenworth, Kan., where in 1856 the father was stabbed by a white man, named Dunn, for expressing his hatred of slavery. The father never quite recovered from his wound and died in 1857. When still very young he was employed by the express companies as a rider to carry packages and valuables on horseback across the country, a most dangerous occupation. Soon he became known as a fearless and perfect rider, a keen scout, a reliable plainsman and hunter. When but little over 21 he attracted the notice of United States army officers, who were constantly in need of the services of expert scouts who could be depended upon and who knew the habits and language of the red man. In 1868–69 he was made chief of scouts by General Sheridan, then campaigning against the hostiles. Colonel John Schuyler Crosby, then adjutant under Sheridan, says of Cody: «He carried despatches 100 miles for General Sheridan through terrific fire of hostile bands of Indians and returned with replies safely.» This and his many personal encounters with the Indians, in some of which he saved the day for the troops, made him a noted man. He was the last of the six great scouts of America — Boone, Crockett, Carson, Bridger, «Wild Bill,» «Buffalo Bill.» He gained his name from his dexterity as a hunter, his record being 4,862 buffalo in one season — 69 in one day. He continued actively engaged in frontier work for many years, killing the Cheyenne chief, «Yellow Hand,» in a celebrated personal encounter during the Sioux War of 1876. Early in the eighties he began the carrying out of a cherished idea—to gather about him some of the remaining elements which went to make up a frontier life and exhibit this unique existence in the Eastern States and in Europe. He presently accomplished this end, forming the exhibition called the «Wild West,» now known the world over. In this he gathered scores of Indians, some of whom were once his mortal foes; hundreds of «cow-boys»; the old «Deadwood coach,» used so many years to carry mail and passengers, and much other really valuable material. With this gigantic show he toured America and Europe for nearly 20 years, amassing a fortune which he invested in lands in Nebraska and Wyoming. In the latter State is a town named after him, on his land. In 1901 he became president of «The Cody Military College and International Academy of Rough Riders,» a school on his property in Wyoming where young men may learn to ride and become masters of themselves and their horses — a post-graduate school in manhood, as he termed it. In 1872 he was elected to the Nebraska legislature, later became judge-advocate-general of the Wyoming National Guard. On 3 June 1917 a last tribute was paid to the memory of «Buffalo Bill» by a vast assemblage, when the body of the famous scout was placed in a vault blasted from solid rock on the top of Lookout Mountain, 20 miles from Denver. With others, he has written 'The Great Salt Lake Trail'; and is author of 'The Life of Hon. William F. Cody' (1879); 'Story of the Wild West and Camp-Fire Chats' (1888); 'The Adventures of Buffalo Bill' (1904); 'True Tales of the Plains' (1908).

CODY, Wyo., village and county-seat of Park County, situated on the Shoshone River at the northwest terminus of the Chicago, Burlington and Quincy Railroad. It takes its name from its founder, Col. W. F. Cody (Buffalo Bill) and was incorporated in 1900. It is at the eastern entrance to Yellowstone Park, with which it is connected by a boulevard of 55 miles. Farming by irrigation and cattle and stock raising are the chief industries of the section. The town is well known to tourists. Pop. about 1,800.

COE, Edward Benton, American clergyman: b. Milford, Conn., 11 June 1842; d. New York, 19 March 1914. He was graduated at Yale 1862, studied at Union Theological Seminary 1862–63 and in France and Germany 1864–

67. From 1864 to 1879 he was Street professor of modern languages at Yale, and on 2 Oct. 1879 was ordained by the Classis of New York as one of the ministers of the Collegiate Reformed Dutch Church. He was pastor of the Fifth Avenue and West 48th Street Church till January 1899, when he became senior minister without charge of a specific congregation. He published a number of sermons and a volume entitled 'Life Indeed' (1899).

COE, George Albert, American educator: b. Monroe County, N. Y., 26 March 1862. He was graduated at the University of Rochester in 1884; studied theology at Boston University and in Berlin; was professor of philosophy in the University of Southern California 1888–93; and Evans professor of philosophy in Northwestern University 1893–1909. Since 1909 he has been professor of practical theology in Union Theological Seminary, New York. He is a member of the Religious Education Society of America and was its president in 1909–10. He is the author of 'The Spiritual Life: Studies in the Science of Religion' (1900); 'The Religion of a Mature Mind' (1902); 'Education in Religion and Morals' (1904), and contributions to various philosophical and theological magazines.

COE, Wesley Roswell, American biologist: b. Middlefield, Conn., 11 Nov. 1869. He was educated at the Connecticut Agricultural College and at the Sheffield Scientific School of Yale University and at the universities of Würzburg and Naples. In 1892-95 he was assistant in biology at the Sheffield Scientific School, in 1896–1902 instructor, in 1902–08 assistant professor of comparative anatomy, and in 1909 professor of biology at Yale University. He accompanied the Harriman expedition to Alaska in 1899. He has published 'The Nemerteans' (1901); 'The Nemerteans of Porto Rico' (1901); 'The Nemerteans of the Hawaiian Islands' (1906); 'Echinoderms of Connecticut' (1912).

COE COLLEGE, an educational institution for both sexes, located at Cedar Rapids, Iowa. It was organized in 1881, under the auspices of the Presbyterian Church, and reported at the end of 1915 that it had 55 professors and instructors, 738 students and 12,300 volumes in the library.

CŒCILIAN, or **CÆCILIAN**, sē-sĭl'yăn, limbless amphibians, constituting a family, *Cœciliidæ* or *Cæciliidæ*, and an order *Apoda* or *Gymnophionia*. They are remarkable for the entire absence of limbs, even the internal limb girdles having disappeared, and the bony roof to the temporal region of the skull. In the latter feature they simulate the extinct *Stegocephali*, to which some zoologists believe them to be rather closely related, though the temporal roof is formed by different bones. The form is worm-like, and, notwithstanding that the number of vertebræ may exceed 200, the tail is very short. A series of annular scales, somewhat embedded in the skin, protect the body externally, and as a further adaptation to their burrowing habits the eyes are rendered nearly or quite useless by being buried beneath the skin, the deficiency in sight being compensated by the presence of a pair of nearly unique retractile sensory tentacles.

Some species are viviparous, others oviparous. In the case of the latter the female coils about the eggs and protects them until hatched. The young of many are noteworthy in the possession of external gills, while the respiration of the adults is pulmonary. Their food consists principally of earthworms and subterranean insect larvæ.

Dr. Boulenger recognizes 17 genera and 40 species, but probably many remain undiscovered. None have been found except in a zone encircling the earth, chiefly within the limits of the tropics; South and Central American species are numerous; but none are certainly known from North America. Consult Boulenger, 'Proceedings of the Zoological Society of London' (1895); Sarasin, 'Forschungen auf Ceylon' (Vol. II, 1887–90).

COEDUCATION, a term meaning joint education, has come to be specifically applied to the instruction of both sexes as a single body in the same classes of the same educational institutions. Coeducation was first tried on a large scale in the United States and has reached its fullest development here. Indeed until very recently it has been regarded as a peculiarly American system of education, but its economy and simplicity, and the difficulty of providing equal educational opportunities for girls by any other method, have led other countries, especially within the last decade, to adopt coeducation in some form or other. This tendency may be expected to show itself more clearly after the close of the great war. The general shortage of men, including of course men teachers, will create a demand for the training of women to fill their vacant places that cannot be resisted by boards of public education. Also the many countries which have recently adopted (or which will soon adopt) woman suffrage will be compelled by the pressure of public opinion backed by women's votes either to open their elementary and secondary schools and universities to girls, or to maintain at almost prohibitive cost equally good separate secondary schools and universities for girls. The expense and impracticability of duplicating higher education have already brought about the admission of women to colleges and universities not only in the United States but elsewhere, and will undoubtedly make the secondary school systems of other countries coeducational as soon as the necessity of educating women is seriously faced. In Great Britain all Scottish universities are frankly coeducational; all the newer English and Welsh universities are coeducational, such as London, Liverpool, Manchester, Birmingham, Sheffield, Leeds, Durham, Bristol, and the University of Wales. Oxford and Cambridge open their lectures and examinations, but not their degrees, to women, and various privately supported women's colleges in their immediate neighborhood prepare women for their examinations, but this last discrimination against women may be expected to disappear now that the votes of British women will directly influence grants to higher education. In Ireland, the National University of Ireland, the colleges of Dublin, Cork, Galway, and Queen's University, Belfast, are coeducational, and even Trinity College of the Catholic University of Dublin admits women to all lectures except those in divinity, engineering, and anatomy. All the universities of South Africa are co-educational. The four universities of India give degrees and open many of their classes to women. In general it may be said that all British and colonial universities, except Oxford and Cambridge and a few native colleges and divinity schools, are open to women on the same terms as men. But, with the exception of the elementary schools in Scotland which are coeducational, state-supported primary and secondary education in Great Britain is still conducted separately for boys and girls. Only small village board schools not attended by sufficient children to form two classes and a few experimental private schools are coeducational. But it is safe to predict that the whole question will be taken up afresh after the war and in all probability solved in the American way in as far as state-supported secondary schools are concerned. Coeducation is the prevailing system in the public schools and universities of the Dominion of Canada and Nova Scotia and New Brunswick, the only exception to university coeducation being the Catholic University of Ottawa. The same is true in the Commonwealth of Australia, New Zealand, Denmark, and Finland. In Norway women are admitted to the universities and coeducation is being experimented with in some of the «people's high schools.» In all other civilized European countries, France, Italy, Spain, Sweden, Belgium, Holland, Switzerland, Greece, Germany, and Austria-Hungary, all the universities are open to women, apart from a few unimportant exceptions such as theological and technical departments where few, if any, women wish to study. Before the Revolution, Russian universities were closed to women, but separate women's university classes were maintained by the government in Petrograd and Moscow, and more or less consistently in the other university towns. By the law of 1912 girls were admitted to the so-called «higher elementary schools» and private persons or agencies were permitted to establish coeducational secondary schools, the principle of coeducation in the higher schools being thus for the first time publicly recognized. Complete coeducation of the sexes may be expected to be among the permanent results of the Russian Revolution. Outside of Russia, Great Britain and her colonies, Switzerland, and Germany, there are very few women studying in the universities. In most countries the preparation of girls for the universities is left entirely to private initiative. For example, even so enlightened a country as France in its higher secondary schools for girls (lycées and collèges) provided before the war no instruction in Latin which is required of all candidates for French university degrees. Since 1914, however, girls have been admitted to the higher classes of some of the boys' lycées and women teachers are of necessity teaching in the boys' lycées. Coeducational primary schools are also permitted in French villages where there are not enough boys and girls of primary age to justify the appointment of two teachers. Coeducation is, therefore, fast becoming an educational question of the first importance in other countries as well as in the United States. The United States, however, differs from all other countries in that its experience includes all kinds of coeducation, primary, secondary, and university, given to many thousands of boys and girls and men and women for nearly half a century. During this time coeducational schools and colleges have greatly increased, while separate schools and colleges have proportionally decreased and the whole question of coeducation has recently become an international issue of such importance as to justify a fresh study of the way in which it has worked in the United States. America is trying separate education and coeducation on such a vast scale that statistics covering so many years may be trusted to indicate results clearly. Also, three generations of women have now been subjected to coeducation and sufficient time has elapsed for its results, whether good or ill, to make themselves felt. The statistics of American coeducational high schools will be of special interest because provision must be made by foreign countries within the next few years for the secondary education of girls, and more especially for the preparation of girls for the universities. Coeducation began in the United States as an almost accidental consequence of the endeavor of the American colonists to carry on the English educational tradition and provide their children with free education in a newly settled country. During the great school revival of 1830–45 and the ensuing years until the outbreak of the Civil War, in 1861, free elementary and secondary schools were gradually established throughout New England and the middle States and in such western States as existed in those days. It was a fortunate circumstance for girls that the country was at that time sparsely settled; in most neighborhoods it was so difficult to secure pupils for even one grammar school and one high school that girls were admitted from the first to both. In the reorganization of lower and higher education that took place between 1865 and 1870 this same system, bringing with it the complete school coeducation of the sexes, was strengthened and enlarged in New England and the middle States and was extended to every part of the west. It was also introduced throughout the south both for whites and negroes. For more than 50 years this great American system of state-supported coeducational primary, grammar, and high schools has withstood all hostile criticism and has spread throughout the whole United States. In no part of the country, except in the conservative east, is any distinction made in elementary or secondary education between boys and girls. Only in a few large cities of the Atlantic seaboard, such as Boston, New York, Philadelphia, Baltimore, Charleston, and in some of the larger cities of the southern States are separate boys and girls' high schools included in the public school system — in almost every instance to the detriment of girls' education. The second fortunate, and in like manner almost accidental, factor in the education of American women was the occurrence of the Civil War at the formative period of the public schools, with the result of placing the elementary and secondary education of both boys and girls overwhelmingly in the hands of women teachers. This effect proved not to be temporary, but permanent, and from 1865 until the present time the relative proportion of women teachers in the public schools has steadily increased from year to year. In 1880 women formed 57.2 per cent; in 1890, 65.5; in 1900, 70.1; in 1910, 78.9; in 1914, 80.2 of all teachers in the public schools. It is significant that the percentage of women teachers is highest (86.5) in the earlier settled North Atlantic Division (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania) where the public schools have been longest in operation. (Report of the United States Commissioner of Education, 1916, Vol. II, p. 29). Like coeducation, the teaching of boys by women in the public schools has been bitterly attacked, especially by German educational authorities, but none of the objections urged against it seem to be supported by experience. American men educated by American women are so far from being feminized thereby that it is generally admitted they can hold their own in competition with men of other countries in athletics, games, daring sports of all kinds, in business enterprise, invention, scientific research, and technical skill. Fifty years of experience in coeducational schools seems to prove conclusively that women teachers of first rate mental ability and training succeed better with boys, as well as with girls, than men teachers of second or third rate intelligence; and further, that while business and professional life offer to men so much greater rewards than the public schools, only such second rate men can be induced to teach in them in considerable numbers. The increase of women teachers is already manifesting itself in other countries and as in the United States is noticeable first in primary schools. For example, in 1915, women formed 85 per cent of all teachers in the elementary schools of Canada and Newfoundland, and 71.3 of all teachers in the primary schools of Norway. The great war now in progress will undoubtedly accelerate the falling percentage of men teachers in the United States and will create in Europe a much greater shortage of men public school teachers than existed in America after the Civil War. As in the United States, in 1865–70, an overwhelming increase in women teachers may be looked for in all the warring countries. It is probable that a similar situation will bring about similar results and that as one of the by-products of the present war coeducation will be introduced very generally into all state-supported schools, especially in the more expensively organized higher schools for boys which prepare for the universities. Whenever women teachers are in the majority it is clear that they must receive the best possible training to teach the children of a nation, and their claim to be admitted to state-supported schools and universities becomes irresistible. In the United States coeducation spread from the public schools to the State universities of the west and from the State universities to the more conservative private university foundations of the eastern States. When most of the State universities of the west were founded they were in reality scarcely more than secondary schools supplemented in most cases by large preparatory departments. Girls were already being educated with boys in all the high schools of the west, and not to admit them to the State universities would have been to break with tradition. Women were also firmly established as teachers in the secondary schools, and it was patent to all thoughtful men that they must be given opportunities for higher education, if only for the sake of the secondary education of the boys of the country. The coeducation of men and women in colleges, and at the same time the college education of women, began in Ohio, the earliest settled of the western States. In 1833, Oberlin Collegiate Institute (not chartered as a college until 1850) was opened, admitting from the first both men and women. It was the first institution for collegiate instruction in the United States where large numbers of men and women were educated together, and the uniformly favorable testimony of its faculty exerted great influence on the side of coeducation. In 1853, Antioch College, also in Ohio, was opened and admitted from the beginning men and women on equal terms. From this time on it became a custom for State universities as they were opened one after another in the west to admit women. The State universities of Utah, opened in 1850, Iowa, opened in 1856, Washington, opened in 1862, Kansas, opened in 1866, Minnesota, opened in 1868, and Nebraska, opened in 1871, were coeducational from the first. Indiana, opened as early as 1820, admitted women in 1868. The University of Michigan, at this time the most important western university and the only western university well known in the east before the Civil War, opened its doors to women in 1870 and admitted them for the first time to instruction of true college grade. This step was taken against the wish of the faculty as a whole in response to public sentiment as is shown by the action of the Michigan legislature. The example of the University of Michigan was quickly followed by all the leading universities of the west. In the same year women were allowed to enter the State universities of Illinois and California; in 1873, the only remaining western State university closed to women, that of Ohio, admitted them. Wisconsin, which, since 1860, had given some instruction to women, became in 1874 unreservedly coeducational. All the State universities of the west, organized since 1871, have admitted women from the first. In the 23 States which, for convenience, are classified as western, there are now 23 State universities open to women. The College of Hawaii and Porto Rico University are also coeducational. The 16 States included in the South Atlantic and South Central Divisions by the United States Commissioner of Education, all of them southern in sympathy, admitted the claims of women more slowly, as was to be expected. Missouri, the most western, became coeducational as early as 1870, and the University of Texas and the University of Oklahoma were opened in 1883 and 1892 respectively, as coeducational institutions; Mississippi admitted women in 1882; Kentucky, in 1889; Alabama, in 1893; South Carolina, in 1894; North Carolina, in 1897 (but only women prepared to enter the junior and senior years); West Virginia, in 1897; Delaware College, the one State college of Delaware, as recently as in 1914 opened an affiliated college for women, supported by the State legislature. The state-supported universities and colleges of Maryland, Virginia, Georgia and Florida are all still closed to women, but strenuous efforts, which may be expected ultimately to succeed, have been made at the last three sessions of the Virginia legislature to secure the admission of women to the University of Virginia, which is the most conservative and also one of the best of Southern universities. In the States enumerated earlier in this article as belonging to the North Atlantic Division all the State-supported colleges are open to women although these institutions are relatively unimportant as compared with the privately supported colleges in this section. This brief review of educational conditions in the United States shows conclusively that public opinion based on 48 years of experience has definitely settled the question of coeducation, i.e., the right of women to share equally with men the instruction given in schools, colleges and universities supported by the state. Whenever State agricultural, technical or mechanic arts institutions are not coeducational it is safe to conclude that women have not yet wished to be admitted to them. The few attempts that have been made to segregate men and women in State universities have failed. For example, a proposal made in 1907 to section the large elementary classes of the University of Wisconsin on the basis of sex rather than of ability, or alphabetically, was effectively disposed of by the 1909 act of the Wisconsin legislature depriving the board of regents of the power to introduce sex discrimination into the instruction of the university. It may be urged, however, that coeducation has been universally adopted in state-supported schools and universities under the compulsion of public opinion operating through public boards of education and State legislatures and not by reason of the genuine success of coeducation itself as a system of education. From this point of view the adoption of coeducation by privately endowed colleges and universities, especially by the older men's colleges in the east which were founded long before women were allowed to teach, or even to study, in American schools, is more convincing. Moreover, the education of young people in school and college is carried on in private institutions to a much greater extent in the United States than in any other country except Great Britain. Our independent schools and colleges founded by private or denominational initiative and maintained by voluntary gifts were originally modeled on similar English foundations and have in the past reached a great development. Of the 569 universities, colleges and technical schools tabulated by the United States Commissioner of Education (including six affiliated women's colleges omitted from his tabulation) 473 are private foundations teaching 140,371 students as compared with 96 state or municipal institutions teaching 96,797. Of these 473 private colleges and universities, 19 are technical or industrial schools where women do not as yet wish to study, five are military schools, and 62 are colleges under the control of the Roman Catholic Church, which in the United States is opposed on principle to the coeducation of the sexes and is impervious to argument. Of the remaining 387 institutions of liberal arts, 62 are separate colleges for men, 56 are separate colleges for women, nine are colleges for women affiliated to colleges for men, and 260 are frankly coeducational, i.e., even of all private colleges of liberal arts where men study, only 20 per cent teach men separately from women, and nine, including some of the most important of these 62 separate men's colleges, share their professors, and in some cases their endowments, with an affiliated woman's college. All separate universities for men maintaining graduate schools of art and science of any importance except the University of Virginia and Princeton University, open their graduate schools to women. All university schools of medicine, law, and theology either now admit women or will soon admit them. Of the 95 medical schools tabulated in the 1916 Report of the United States Commissioner of Education, 67 were coeducational, including four of the most important private university schools, John Hopkins, Cornell, Rush, and the University of Pennsylvania. The private medical school of Tulane University admitted women in 1915; the private medical schools of Columbia, Yale, and Washington universities have announced that they will admit women, and the medical school of Harvard is expected to follow their example. Of 29 State university medical schools, 22 are coeducational. Professional schools of law in all State universities are either opened, or will be opened as soon as women wish to study in them, and three of the most important private university law schools in the United States, Pennsylvania, Columbia and Harvard, are already open, or have announced that they expect to admit women. Coeducation has steadily increased in favor from the beginning of the experiment on a large scale in 1870 until the present time when an insistent public opinion enforces the claim of women to their share in the education given to men even in privately endowed universities. This public opinion is all-powerful in the case of public foundations and cannot be disregarded by private educational institutions dependent for support on private gifts. It has already compelled all the leading graduate and professional university schools to admit women and has established side by side with men's undergraduate colleges co-ordinate, or affiliated, women's colleges in eight privately supported men's universities and colleges and in the State college of Delaware, all except one (Western Reserve) situated in the east of the United States. Separate colleges for men will continue to exist in the eastern States only as long as through their strongly developed dormitory and campus life they partake of the nature of private clubs. Their separate existence has in a sense compelled the foundation of the great women's colleges in the east with the same highly organized social life and college traditions and customs. The extravagance of such duplication, however, has limited the spread of separate men's and women's colleges, which show even now a tendency to attract as students specially selected men and women whose parents are able to pay for the combination of high academic standards with a peculiarly attractive social life. Much of the culture and many of the priceless associations of college life are to be obtained only by residence in college halls. Coeducational colleges have not as yet succeeded in offering their students such a complete college life as the separate men's and women's colleges although the progress made in this direction within the last 10 years indicates that there is no reason why it cannot be organized both for men and women equally well in coeducational universities. All the arguments against the coeducation of the sexes in colleges have been met and answered by experience. It was feared at first that coeducation would lower the standard of scholarship on account of the supposed inferior quality of women's minds. The unanimous experience of coeducational colleges goes to prove that the average academic standing of women is slightly higher than the average standing of men, that women win proportionally more prizes given for scholarly excellence and obtain proportionally higher examination marks. Many explanations of the greater academic success of women students have been suggested but the fact, however it be explained, remains. None of the serious difficulties have arisen that were feared from the association of men and women of marriageable age. The question of health has also been finally disposed of. Thousands of women have been working side by side with men in coeducational institutions for the past 48 years and undergoing exactly the same tests without a larger percentage of withdrawals on account of illness than men, or any appreciable bad effects on health after graduation. A statistical study (made in 1900 and privately printed by the Association of Collegiate Alumnæ) of 3,636 women graduating from college between 1869 and 1898 furnishes satisfactory evidence as to their length of life, present health, rate of marriage, number of children, number of living children, etc., as compared with their sisters and cousins who are not college graduates. A larger percentage of women graduates of coeducational colleges are married, and their average age of marriage seems to be about a year earlier than that of graduates of separate colleges, but both these facts may be due to the difference in local customs between the east and the west. A college education, whether obtained in separate colleges for women or in coeducational colleges, justifies itself in many surprising and rather unexpected ways. College women as a whole seem to marry on an average two years later than their sisters who have not received a college education; but as they have on an average more children than their sisters, and succeed in bringing up a few more of the children born to them, this would seem to be rather an advantage than otherwise, especially as they also seem to make slightly better marriages financially than their sisters. The four careful statistical studies that have been made of the after effects of college education on women indicate clearly that vitally important racial matters, such as the marriage rate, the number of children born per marriage, the health, the occupations of men and women, etc., are controlled not by the (from this point of view) relatively unimportant question of whether or not they have spent four years in college, but by the customs and ideals of the social and financial groups to which they and their families belong. It has been observed that women and men in western coeducational colleges tend to choose different subjects of study, for example, more men than women elect economics, mathematics, physics, and chemistry, and more women than men elect Latin, English, French, and German. In the separate men's and women's colleges in the east, however, the popular electives are the same for men and women, women crowding into economics, and men into English, and both deserting mathematics and Greek for French and Spanish. It is probable that the difference in the choice of electives, where it exists, is due not to sex preference but rather to the more strictly vocational character of college courses in western universities and to the difference in the occupations to be engaged in after graduation by men and women students. Up to the beginning of the great war teaching has been the chief profession of college women. From 60 to 65 per cent of all women in western coeducational colleges have expected to teach and consequently have taken the college courses that best fitted them for this occupation; whereas men have elected courses to prepare them for business, industry, politics, and the school positions in science which are as a rule filled by men in western high schools. Also many more women than men in the college departments of coeducational western universities are taking a college course for the purposes of general culture and consequently tend to select the same studies that are taken by both men and women students who are studying in the separate men's and women's colleges in the east with a similar purpose. That coeducation is regarded favorably by men and women (or at least that it does not in any way interfere with their preferring coeducational to separate colleges), is shown by the striking increase of coeducational colleges, and of men and women students studying in them, as compared with the decrease of separate colleges for men and women and of students studying in them. In the 45 years that have elapsed between 1870 and 1915, 235 higher educational institutions classed as colleges and universities by the United States Commissioner of Education have been founded. Of these, 21 (19 mens' and 2 women's) are Roman Catholic, 14 are schools of technology and mechanic arts in which women do not as yet desire to study. Of the remaining 200 colleges giving a liberal college education 156 colleges are coëducational, only six are separate colleges for men, 29 are separate colleges for women, and nine are separate colleges for women affiliated to separate undergraduate colleges for men; or 78 per cent of the whole number are coeducational, only 3 per cent are separate colleges for men, and only 19 per cent are separate women's independent or affiliated colleges. Of all liberal arts undergraduate colleges open to men founded since 1870 (excluding Roman Catholic colleges) 96 per cent are now coeducational and only 4 per cent teach men separately from women. Of the above six separate men's colleges 3 are situated in the southern States, and in the case of two only (Johns Hopkins in Maryland and Clark College in Massachusetts), is the exclusion of women from their college departments of any special moment, and both these institutions admit women freely to all their graduate and professional work. Only 1,156 men were studying in the year 1915 in the college departments of these six college as compared to thousands studying in the college departments of the 156 coeducational colleges. The trend toward coeducation has become still more marked since 1900. Only one separate college for men, Clark College, Massachusetts, with 141 students, has been opened since 1900. Of the 29 separate women's colleges only six have been founded since the year 1900, four of the six being situated in the southern States, and three being under denominational control. Apart from Simmons College, which is more of a technical or vocational school than a liberal arts college, and should be classified rather with the nine technical schools for men omitted from these statistics, no one of the other five separate women's colleges is of any considerable academic standing and only 699 women students of college grade are studying in them. Of the nine separate affiliated women's colleges only four (affiliated to Tufts, Hobart, Richmond, and Delaware,) have been opened since the year 1900 and only very few women are studying in them. Since 1870 only one of the smaller eastern coeducational colleges (Wesleyan, with 454 men college students) has excluded women and become a separate men's college; only one small western college, Downer (now Milwaukee-Downer, with 198 women students) has excluded men and become a women's college, and only two (Western Reserve University, with 426 women, and Tufts, with 92 women) have segregated their women students in affiliated colleges; while on the other hand during the same period of time large numbers of private men's colleges have become coeducational. Including the two above mentioned colleges there were in 1915 only nine such affiliated colleges in the United States. Only one private university, Leland Stanford Junior, has limited the number of women undergraduates and only two other private foundations (Chicago University in Illinois and Colby College in Maine) make any attempt to segregate women students in certain elementary classes. Colby teaches its 155 women separately in the first two years of the college course but Chicago, which has been experimenting with segregation since 1902, has practically discarded it, and in April 1918, taught its great body of over 4,000 women separately from men in only 4 out of 52 classes offered to first and second year students. All other classes in the university were coeducational. In 1870, when coeducation was first generally adopted in State universities, coeducational colleges formed only 30.7 per cent of all colleges and universitics in which men were studying. Since then the increase of coeducational colleges and the decrease of separate men's colleges have been extraordinarily rapid, as follows: 1870, percentage of coeducational colleges to whole number of liberal arts colleges open to men, 30.7; 1880, 51.3; 1890, 65.5; 1900, 70; 1910, 70.7, or (omitting Roman Catholic colleges) 80.7; 1915, 76.5, or (omitting Roman Catholic colleges) coeducational colleges formed 88.3 per cent of all liberal arts colleges open to men and 91 per cent of all such colleges open to women. (Consult college and university statistics published in Reports of the United States Commissioner of Education for the corresponding years, it being noted that military and technical colleges, and in some cases, when stated, Roman Catholic colleges, have been omitted in calculating these percentages). The 1915 statistics have been corrected throughout by the addition of the five affiliated women's colleges (College for Women of Western Reserve University, Women's College in Brown University, Jackson College of Tufts College, William Smith College of Hobart College, Westhampton College of Richmond College, Women's College of Delaware State College) omitted by the Commissioner of Education and by the transfer of the six corresponding men's colleges from the group of coeducational colleges to the group of separate men's colleges. In 1915, 71 per cent of all men undergraduate students and 76 per cent of all women undergraduate students were studying in coeducational colleges and universities. This cannot be explained by the fact that for financial reasons students prefer public universities, which offer education free of charge and are also with very few exceptions coeducational, because the greater number of men and women are still studying in private colleges and universities which offer the choice of a separate or coeducational college education. In 1915 women formed about 35 per cent of all graduate and undergraduate college students in the United States, but, if the students of Roman Catholic, military, and technical colleges be omitted, women studying in undergraduate coeducational colleges of liberal arts formed 42 per cent of the total number of men and women in coeducational colleges. In many coeducational colleges women now equal and sometimes exceed men, and their numbers are steadily increasing. In 1915 there were 79,763 undergraduate and 5,098 graduate women students, in all 84,861 women, studying in American colleges and universities. The United States is the only country in the world where many thousands of women are receiving a university education. This statistical study speaks for itself and shows clearly the overwhelming trend toward coeducation in the college education of both men and women. It shows also that the tendency toward coeducation has become even more marked since the year 1900, that is, after 30 years of successful trial of the system. In like manner the school statistics published by the United States Commissioner of Education prove that coeducation in primary and secondary schools has been equally successful. The common school system of the United States is uncompromisingly coeducational. No distinction between coeducational and separate schools is made by the United States Commissioner of Education in giving the statistics of public elementary schools, presumably because they are all coeducational. In 1915, of all children in elementary schools 91 per cent were in public elementary schools. Not only are practically all public elementary schools coeducational, but almost all privately supported elementary schools are coeducational. Public high schools also are almost entirely coeducational. In 1915 there were 11,674 public and 2,248 private high schools. Of the 11,674 public high schools all except 63 were coeducational and only 37,043 girls were studying in separate high schools for girls, as compared with 690,497 studying in coeducational high schools, i.e., only 5 per cent of the total number of girls studying in public high schools were in separate girls' high schools — an altogether negligible quantity. In the 25 years from 1890 to 1915 the percentage of pupils studying in private high schools as compared with pupils studying in public high schools has steadily decreased, as follows: in 1890, private high school pupils were 39.25 per cent of all high school pupils; in 1900, 17.59 per cent; in 1910, 11.37 per cent;

in 1915, 10.45 per cent. During these 25 years the number of public high schools has increased from 2,526 to 11,694 while private high schools have not even doubled themselves, increasing only from 1,632 to 2,248, and of all the boys and girls studying in high schools in 1915 only 10.45 per cent were studying in private high schools. The great increase of public high schools, which are practically coeducational, as compared with private high schools shows the success of high school coeducation in the United States. Moreover, 44 per cent of all private high schools are also coeducational and 42 per cent of the girls receiving a private high school education, and 45 per cent of the boys, are studying in these coeducational private high schools. In 1915 boys and girls in public and private separate high schools formed only 12 per cent of all pupils in public and private high schools. All the other 88 per cent were in public and private coeducational high schools. In the larger high schools, boys and girls are frequently separated in athletics, gymnastics, recreation, and to some extent in study periods, but the few attempts that have been made to segregate them in separate classes have not succeeded. In vocational work especially when organized in special trade or vocational high schools boys and girls naturally tend to elect different vocational work in order to be fitted for the different occupations open to men and women, but during the present war girls are being trained to undertake men's jobs and after the conclusion of peace the tendency will be to continue to give boys and girls the same vocational work in the high schools. The numbers of both boys and girls studying in high schools in the United States are increasing at a faster rate than the population. There are slightly more girls than boys studying both in public and private high schools, and more girls than boys complete the high school course and graduate. In 1915 girls formed 54.54 per cent of all high school pupils. The extraordinary success of elementary, secondary, and college coeducation in the United States cannot fail to exert a profound influence on the development of the education of girls and women in all European countries. After the conclusion of the present war all other civilized countries must make immediate provision for the higher education of women who will greatly outnumber men in this generation and must consequently receive the best preparation for self-support and national service. As is shown by the experience of the United States women in considerable numbers will be unable to obtain higher education unless like boys they can be prepared for admission to the universities in state-supported schools. The experience of the United States also shows that only comparatively few children of rich parents can afford to study in separate private schools, even if they wish to do so, of which there is no indication. Only 12 per cent of all girls and boys in the United States are studying in separate high schools. There is reason to believe that within the next half century coeducation will become the universal system of school, college and professional education, not only in the United States, where it is now the prevailing system, but also in all other civilized countries.

M. Carey Thomas,
President Bryn Mawr College.

COEFFICIENT OF EXPANSION. See Heat; Thermometry.

COEFFICIENT OF FRICTION. See Friction.

COEHORN, koo'hōrn, **Menno,** Baron van, Dutch engineer: b. near Leeuwarden, Friesland 1641; d. The Hague, 17 March 1704. He studied at the University of Franeker and in his 16th year he entered the Dutch service as captain, and soon rose to the rank of a colonel. During the siege of Graves he made use for the first time of the small mortars, called in honor of their inventor *coehorns,* used for throwing grenades. In the war of 1689, against France, he again distinguished himself. His defense of Fort William, in 1692, which he himself had planned, against the attacks of Vauban, attracted much attention. Both commanders displayed all their talents. In the war of the Spanish Succession Coehorn was made general of the fort and succeeded in reducing six French strongholds. In 1702 he published in Leeuwarden his new theory of fortification. In 1703 he directed several sieges. He fortified almost all the strong places in Holland. Bergen-on-Zoom he considered his masterwork. His system is different from that of Vauban. Vauban operated by manœuvres, and by the skilful direction of his ordnance and his men saved both, and wearied and divided the forces of the enemy; Coehorn crushed by an overpowering mass of artillery and men, and sacrificed both for a rapid and powerful effect. Consult De Peyster, 'Life of Coehorn' (New York 1860); Bonomer, 'Essai générale de fortification' (Paris 1814); Cosseran de Villenoisy, 'Essai historique sur la fortification' (1869).

CŒLE-SYRIA, sē'lē-sĭr'ĭ-ạ ("Hollow Syria"), the ancient name of the large valley lying between the Lebanon and Anti-Lebanon mountain ranges in Syria. The valley is about 100 miles in length. Near its centre are the ruins of Baalbek, or Heliopolis, and near the ruins rise the rivers Orontes and Litany, which water and fertilize the plain. The name in the 2d century included all the country (except Judea and Phœnicia) extending from Seleucis to the confines of Egypt and Arabia. In Roman times it was again confined to the territory east of the Jordan, consisting of Perea, the Decapolis and the provinces which constituted the tetrachy of Philip. In 47 B.C. Herod was delegated by the Romans as military head. Later in the Roman period 297 A.D., the term receded to the region between Taurus and Phœnicia. To-day, it is used in the sense first noted. Consult Hölscher, 'Palästina in der persischen und hellenistischen Zeit' (1903); Smith, 'Historical Geography of the Holy Land' (11th ed., 1904); Leary, 'Syria, the Land of Lebanon' (1913).

CŒLEBS IN SEARCH OF A WIFE, a moral tale by Hannah More, published 1808. This is the best known work of fiction by that prolific moralist. It was written after she had passed her 60th year, and was intended as an antidote to what she considered the deleterious influence of the romantic tales of that day.

CŒLENTERATA, sē-lĕn-tẹ-rā'tă, a phylum of animals distinguished from all others by the following aggregate of characters: Its members consist of two layers of cells only, separated by a gelatinous layer, and exhibit a more or less pronounced radial symmetry. They possess peculiar nematocysts (q.v.) or stinging organs, which are developed from the cells of the outer and sometimes of the inner layer. Such cells are not certainly known in any other group. Sense organs responsive to light and to sound or changes in equilibrium may exist among the cœlenterates, but are of the very simplest character. The differentiation of nerve and muscle cells is indicated, but is as yet very imperfectly developed. There is but one body cavity, which serves the purposes both of digestion and of circulation. All cœlenterates are carnivorous. One opening serves the purposes both of the mouth and of the vent. The individuals may be free, in which case they are known as medusæ or jelly-fishes, or fixed, as with the coral individuals and the sea-anemones, when they are known as polyps. An alternation between the polypoid and medusoid generations is common, with the polypoid generation asexual and the medusoid generation sexual. Either generation may be aborted or entirely absent. It is not yet known which represents the original cœlenterate condition. The asexual generations multiply by fission, or more commonly, by gemmation, and these processes also may occur in the sexual forms. The gemmation often results in the formation of colonies. Both polyps and medusæ may be either separate or colonial. In the colonial forms a high degree of division of labor among the zooids is often found, with a corresponding differentiation of form. A chitinous or calcareous exoskeleton is often found. The cœlenterata are classified as follows:

1. *Hydrozoa.*— The sexual cells discharge directly to the outside. The digestive pouch opens directly to the exterior and is not subdivided by bands of the inner body layer.

2. *Schyphozoa.*— The sexual cells discharge into the digestive-circulatory pouch, which appears to open directly to the exterior, and is not subdivided by bands of the inner body layer. Filaments of the inner body layer may extend into the digestive pouch.

3. *Anthozoa or Actinozoa.*— The sexual cells discharge into the digestive-circulatory pouch, which opens into the outside through a tube lined with the outer body-layer, and is subdivided by bands of the inner body layer supporting this tube, the so-called mesenteries. Radial symmetry is partly replaced by bilateral symmetry. Medusæ are unknown.

The *Ctenophora* (q.v.) are often included among the Cœlenterates, but they possess a middle germ layer and no nematocysts, and show affinities to the flatworms, so that they will be treated under a separate head.

The *Hydrozoa* include many jelly-fish, the common hydra and many other polyp-like forms, and certain so-called «corals.» The *Schyphozoa* include some polyps and many of the more familiar jelly-fishes. The *Anthozoa* include most corals, and the sea-pens and sea-anemones.

Fossil Cœlenterata can be found even in the Lower Cambrian rocks. Not only the skeletons of the various calcareous forms, but the impressions of the circulatory-digestive sac of the frail medusæ, are found from a very early period. The graptolites (q.v.) have been associated with the Cœlenterata by some writers, though others believe them to be Polyzoa. See Actinozoa; Alcyonaria; Coral; Ctenophora; Gorgonia; Hydra; Hydrozoa; Jelly-fish; Polyps; Portuguese Man-of-War; Sea-anemones; Sea-pen; Siphonophora; Zoophytes. Consult Hickson, 'Cœlenterata' ('Cambridge Natural History,' Vol. I, London 1906); Mayer, 'The Medusæ of the World' (Carnegie Inst. Pub., Washington 1911); Minchin, 'Cœlenterata' (in Lankester's 'A Treatise on Zoology,' Vol. II, London 1900).

CŒNOGENESIS. See Recapitulation.

CŒPHORI. See Æschylus.

COERCION. A term employed in political science to describe the means (principally non-judicial) for securing obedience to law.

State Coercion.— When the Southern States issued their ordinances of secession in 1860 to 1861, the action constituted an effort to nullify the action of the Federal government upon individuals by setting up the authority of States in opposition to that of the Federal government. The South believed that the Federal government was simply a compact between separate and sovereign political bodies, that the powers of the Federal government were held in trust for the States themselves, and that sovereignty therefore was not in the hands of the Federal government but in the hands of the people who had created these governments, not, however, as a mass, but rather as individual States. The South thought that under the Constitution the Federal government was given only certain specific powers which it did not possess under the Articles of Confederation (q.v.) and that the Constitution did not conflict with nor the Federal government supersede the sovereignty of the States.

There was considerable discussion of the right of the Federal government to coerce a State. In 1832–33, during the dispute over nullification (q.v.) in South Carolina, President Jackson said: «To say that any State may at pleasure secede from the Union is to say that the United States are not a nation. Secession, like any other revolutionary act, may be morally justified by the extremity of oppression, but to call it a constitutional right is confounding the meaning of terms.» And again: «The right of the people of a single State to absolve themselves at will and without the consent of the other States from their most solemn obligations, and hazard the liberties and happiness of the millions composing this Union, can not be acknowledged. Such authority is believed to be utterly repugnant both to the principles upon which the general government is constituted and to the objects which it is expressly formed to attain.» On the other hand he said: «That a State or any great portion of the people, suffering under long and intolerable oppression and having tried all constitutional remedies without the hope of redress, may have a natural right, when their happiness can be not otherwise secured, and when they can do so without greater injury to others, to absolve themselves from their obligations to the government and appeal to the last resort, needs not be denied.» (Richardson, J. D., ‹Messages and Papers of the Presidents,› Vol. II, pp. 640–56). On 25 Nov. 1860 the New York *Herald*, an independent journal, said: «Coercion in any event is out of the question. A union held together by the bayonet would be nothing better than a military despotism.» And again: «Each State is organized as a complete government, holding the purse and wielding the sword, possessing the right to break the tie of the confederation and to repel coercion as a nation might repel invasion. . . . Coercion, if it were possible, is out of the question.»

In his message of 3 Dec. 1860 President Buchanan declared that no State possessed the right to secede, but on the other hand he stated that the Constitution contained nothing which would grant the Federal government the right to coerce a State, and therefore he apparently had no right to prevent secession. (Richardson, ‹Messages,› Vol. V, pp. 626–653). Buchanan based his message on an opinion given him by his Attorney-General, Jeremiah S. Black, 20 Nov. 1860, in which, among other things, the latter said that the Federal government had the right to «preserve itself in its whole constitutional vigor by repelling a direct and positive aggression upon its property or its officers,» but that «an offensive war to compel a State to recognize the supremacy of the government of the United States» would destroy the Union, immediately and completely. (‹Opinions of the Attorney-Generals,› Vol. IX, p. 516 et seq.). The seceding States held that there was no constitutional provision that met the case because a State could not be coerced; in his speech of 21 Jan. 1861, when resigning from the Senate, Jefferson Davis said: «If it be the purpose of gentlemen they may make war against a State which has withdrawn from the Union; but there are no laws of the United States to be executed within the limits of a seceded State. . . . A state [in such condition] . . . claims to be exempt from any power to execute the laws of the United States within her limits.» (*Congressional Globe*, 36th Congress, 2d session, p. 487). The Southerners made much of the fact that the Federal convention did not provide for coercion of States but on the contrary omitted it from the Constitution. But the power of coercion was omitted because a government over people was established which had the right to enforce law on persons. The Northern statesmen insisted that no State could exist or act except under its obligations to the Federal Union; and that the power to coerce individuals could not be dissolved by any State. It would have been appropriate to provide for the coercion of States in a union of sovereignties where obligations might have been enforced suitably by war; but where the system established provided for a government immediately over men who were subject directly to the commands of that government, coercion was inappropriate. Any action by a State government which conflicts with its duty as a member of the Union is illegal; officials who carry out unconstitutional legislation are not properly State officers; people cannot legally perform illegal acts. Lincoln and the Federal government insisted that they were dealing only with individuals. In his speech of 29 Dec. 1860 Lyman Trumbull said:

> "If there is anybody in this Senate, or in this country, who ever talked of the United States declaring war against one of its States, or of coercing one of its States, or ever entertained such notion, I know not who it is. I have never seen him. This phrase, 'coerce a State,' is a phrase calculated to mislead the public mind. . . . Nobody proposes to declare war against a State. That would admit at once that the State was out of the Union — a foreign government. Of course we cannot declare war against a State. Nobody proposes to coerce a State or to convict a State of treason. You cannot arraign a State for trial; you cannot convict it or punish it; but you can punish individuals." (*Congressional Globe*, 36th Congress, 2d Session, Pt. I, p. 156).

«A reading of President Buchanan's message above mentioned shows that he entirely confused the power of the United States to coerce a recalcitrant State — a power it surely possesses — with its right to enforce the laws of the United States wherever they are applicable, and to use the armed force whenever it may be necessary to accomplish this end — a power which it undoubtedly possesses. Even the most strenuous opponent of secession would probably not have defended the right to apply coercion against a State as a corporate political entity. But the power to proceed against its citizens for violating the laws and to protect the public property was a very different thing, for the President is bound by oath to see that the laws are faithfully executed. President Lincoln in his inaugural address practically agreed with President Buchanan that the Federal government had no power to wage war against a State, as such, or to proceed against it by way of Federal execution, but he denied that, because it could not coerce a State, it could not defend the public property against attack or compel obedience to its laws by those subject to its jurisdiction. The Union, he said, was sovereign and it was intended to be perpetual, from which it followed that no State upon its mere motion could lawfully get out of the Union; that resolves and ordinances to that effect were legally void; and that acts of violence within any State or States against the authority of the United States were insurrectionary or revolutionary, according to circumstances. At the same time he announced his determination to hold, occupy and possess the property and places belonging to the government of the United States and to collect the duties and imposts everywhere. No attempt was to be made to coerce any State as such, but only to compel obedience to the laws; and in his call for the militia it was stated that their services were to be employed in overcoming the resistance to the laws by combinations of persons too powerful to be suppressed by the ordinary course of judicial proceedings.» (J. W. Garner, in Wiley and Rines, ‹The United States,› Vol. VIII, p. 8). For Lincoln's messages above mentioned, consult Richardson, ‹Messages,› (Vol. VI, pp. 5–14); Nicolay and Hay, ‹Life of Lincoln,› (Vol. III, pp. 327–344).

In his amnesty proclamation of 8 Dec. 1863 Lincoln offered to recognize the communities containing such combinations of individuals if they would again establish State governments in conformity with the Constitution. (Richardson, ‹Messages,› Vol. VI, pp. 213–15; Nicolay and Hay, ‹Complete Works of Abraham Lincoln,› Vol. II, pp. 442–44). Lincoln and his supporters believed that the "loyal" element of the Southern States was large but that the functions of the State governments had been usurped by combinations of disloyal persons and that therefore the rights of the States had not been destroyed but simply suspended temporarily by the acts of the Confederate officials, who were not recognized. Lincoln did not regard the acts of the Confederate authorities as legal or quasi-legal, and held that the existence of the States themselves was not affected by the disloyal acts of a portion of their inhabitants. These States therefore were simply out of their "proper practical relations" with the Federal government on account of the war. His plan was to restore to the people their former rights by pardon and amnesty upon promise of future loyalty, in order that they might begin the work of forming new State and local governments; but he believed that the preponderance of power in such State governments should be in the hands of the loyal element of the population. (Nicolay and Hay, 'Complete Works,' Vol. II, pp. 672–75, and 'Life of Lincoln,' Vol. IX, p. 475 et seq.). With this idea in mind he began the reconstruction and this eventually was the accepted form of procedure. See Secession; United States — Causes of the Civil War, Secession in the, and Reconstruction; Nullification; Virginia and Kentucky Resolutions; State Rights; Sovereignty; Insurrection; Rebellion; War Power, Constitutional; Interposition.

Individual Coercion.— It is necessary for the proper conduct of government that sufficient physical force be provided to protect government officials in the exercise of their designated functions. Our laws define offenses that strike at the root of government; our judicial courts have authority to cause the arrest of offenders; and offenders should be tried and punished. If the regular processes be prevented by force the Federal and State courts have power to appoint temporary officers who may call for assistance on the "posse comitatus"— that is, all able-bodied men within their jurisdiction. If these forces be impotent the governor of the State may be requested to send aid, his usual force being the militia. The purpose of the militia is not to arrest this or that individual but to break up organized resistance, wherefore they may be ordered or compelled to fire into rioters or mobs which may only have the appearance of creating a disturbance but which may not have committed any other offense. Individuals in such instances are regarded as outside the protection of the law and have no redress, being subject to dispersal so long as they maintain an attitude of resistance. If the militia be insufficient to protect the State against domestic violence the State executive may request aid of the President of the United States (Constitution, Art. IV, Sec. IV), who may, if necessary, use the militia of other States or regular troops or sailors. Sometimes these local disturbances (like the Pullman strikes in Chicago in 1894) interfere with the execution of Federal laws, whereupon, without calling upon the States, the President may send militia or regulars on his own initiative. If the disturbances become especially violent, the habeas corpus may be suspended or martial law may be declared, in either of which cases a suspected person may be arrested and held without charge or trial for any length of time in the discretion of the proper authorities.

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COERCION, *in law*, any application of physical or other force by which a person is compelled to do or refrain from doing something; intimidation. The legal effect of coercion depends upon its violence and other attendant circumstances. Where one commits a crime under coercion in the reasonable belief that he will be killed or seriously injured if he does not do so, his act is held to be excusable. Coercion may be indirect, as when applied to one's husband, wife, mother, father, brother, sister or other near relative, and in some cases such coercion may have the same effect as if applied to the person directly. Where a wife commits any crime except treason, homicide or perhaps highway robbery in the presence of her husband, she is usually presumed to have done so under his coercion, and is therefore not punishable. Coercion is a ground for invalidating a contract in a civil suit.

COERCION ACTS, a bill introduced by the Grey ministry into the English Parliament 1833. See Ireland — *History*.

COERNE, Louis Adolphe, American composer: b. Newark, N. J., 27 Feb. 1870. He was educated at Harvard University and at the Royal Academy of Music, Munich. He was musical director at Buffalo, N. Y., 1894–97; Columbus, Ohio, 1897–99; and Troy, N. Y., 1907–09. In 1910–15 he was professor of the history and science of music at the University of Wisconsin, and since 1915 he has been professor of music at Connecticut College. He is author of 'The Evolution of Modern Orchestration' (1908) and composer of 82 complete works, including 'Hiawatha,' symphonic poem (Munich 1893; Boston 1894); 'Jubilee March,' written for massed band performances at Chicago Exposition 1893; 'Woman of Marblehead,' grand opera (1905); 'Beloved America';

'Sakuntala' (1904); and 'Zenobia,' grand opera (1905–06). The last named work was the first grand opera by a native of the United States to be performed in Europe.

COETHEN, kė'tĕn, Germany, a town in the duchy of Anhalt, in a fertile and attractive district on the Ziethe about 80 miles southwest of Berlin. It was, till 1853, the capital of the former duchy of Anhalt-Cöthen. It consists of the old and the new town and several suburbs; has a fine Protestant cathedral church in the Gothic style, with old glass-paintings and a fine organ; the former ducal residence with library, picture-gallery and museum; a gymnasium, normal and several other schools. There are manufactures of machinery and metal goods, and various other industries. Beet-sugar is a stable article of commerce. The town dates back to the 10th century. Pop. about 23,000.

CŒUR, kėr, **Jacques**, French merchant and royal treasurer: b. Bourges toward the end of the 14th century; d. Chios, in the island of Scio, 25 Nov. 1456. His vast commercial enterprise attracted the attention of Charles VII, who in 1435 appointed him master of the French mint, and afterward treasurer. His excellent management of affairs caused the king to ennoble him, and to entrust him with high functions in the French provinces, and diplomatic missions in Italy. Cœur contributed 200,000 crowns to help the king in rescuing Normandy from the English. After the successful end of the war, his influence became so great as to give offense to envious persons, who after the death of the king's mistress, Agnes Sorel, charged him with having poisoned her, and caused him to be arrested (1451), and his vast property to be confiscated. Although the charge was proved to be groundless, he was detained in prison until 1455, when he effected his escape. Repairing to Rome, he was kindly received by Pope Nicholas V, and was enabled to gather the broken remains of his fortune. He had vainly claimed the clemency of Charles VII in favor of his family, and it was under Louis XI only that his memory was exculpated from all charges, while a part of his property was afterward restored to his descendants. Consult Clément, 'Jacques Cœur et Charles VII' (Paris 1866).

CŒUR D'ALÉNE, kėr dä-lān (Fr. «awl-heart»). (1) A name given by the French *voyageurs*, traditionally from the stinginess of a chief, to a tribe of Indians of the Salishan stock, though with a dialect widely different from the other members. Their own name is Skitswish, which Lewis and Clarke rendered Skitzoomish. When found by Lewis and Clarke they occupied a considerable tract in northern Idaho and Washington, near the lake named after them. There were perhaps 2,000 of them, rather squalid and unadventurous, though cruel; they lived on roots, fish and small game, and did not visit the buffalo grounds. Father de Smet visited them in 1841, and the next year a Catholic mission was established among them, and they became Christians. They had regular dwellings and a mill; but they were hostile to the encroaching whites, and in 1858 their chief, Vincent, with a band of his warriors, joined in a war on them, which was only put down by General Wright after two sharp battles, at Four Lakes and Spokane Plains. In 1867 part of them were placed on a reservation in Idaho, and in 1872 the rest were removed to the Colville Reservation, between the Okanogan and Columbia rivers. (2) A lake in northern Idaho, situated among mountains of the same name. The rivers Cœur d'Alêne and Saint Joseph flow into the lake at its southern end, and the Spokane River is its outlet at the north. It is about 30 miles long and from two to four miles wide. The region is a mining district, and has been the scene of serious labor troubles, especially in 1892 and 1899. (3) City and county seat of Kootenai County, Idaho, 33 miles east of Spokane, Wash., on the lake of the same name, and on the Northern Pacific and Chicago, Milwaukee and Saint Paul railroads. The city contains a college, a Catholic academy, two parks and the Old Fort Sherman military grounds. It manufactures lumber, ties, shingles, brick and trades in fruits and farm products. The town is popular as a centre of a fishing and hunting region.

CŒUR DE LION, kėr dė lē-ôn, a title given to several historical personages, as Richard I of England; so called from the prodigies of personal valor performed by him in the Holy Land; Louis VIII of France, frequently called *Le Lion;* and Bolaslas I of Poland, also called «The Intrepid.»

COFFEE, the seed of a small evergreen tree, which is cultivated in tropical countries, supposed to be native to Abyssinia, although it was early found in Arabia. The plant belongs to the genus *Coffea*, order *Rubiaceæ*. In the wild state it grows to a height of from 6 to 30 feet, but in cultivation it is pruned and kept between 6 and 10 feet. The leaves are green, glossy on the upper side, and somewhat resemble those of the laurel, but less dry and thick. The flowers are white, fragant and grow in clusters from the axils of the branches. The fruit, often called berries, grows in clusters of from 3 to 12, each with a short stem or sessile. The fruit when ripe resembles in appearance a dark red cherry, or a medium-sized cranberry. Each berry contains two seeds embedded in a yellowish, sweetish pulp which, when ripe, is delicious.

The trees are raised from seed grown in nurseries, and when of a size to endure variations of temperature, usually in about six months' time, they are transplanted to the coffee orchard. They begin to bear when three years old, and yield fruit for about 20 years. Considerable space is left between the trees, and corn, bananas and plantain are grown among them, especially when young. The first year's crop is small, but when in full bearing a tree will yield from one to five pounds, according to location and variety. The regions best adapted to the growth of coffee are between the parallels of 15 north and 15 south latitude, and from 1,000 to 4,000 feet above sea-level. It is cultivated from lat. 25° N. to 30° S., in places where the temperature does not fall below 55° F. Moist and somewhat shady slopes are found most desirable. Little streams of water are conducted to the roots of the trees, which are kept very wet until the fruit is nearly ripe; then the water is turned off to keep the fruit from becoming too succulent. The fruit varies in size and color according to the altitude in which it grows; that from highlands is small and green; that grown on lowland and near the coast is larger and of a yellowish tinge. The wild trees of Liberia, which grow in the lowlands, produce the largest fruit known, but it is of inferior quality. The coffee from the Far East can be distinguished by its large bean of a yellow color, while that of Central and South America is smaller and of greenish color. The fruit is harvested with great care, cloths being placed under the trees before shaking them. The fruit is then exposed to the sun to dry, after which it is pulped, washed, dried again, hulled, cleaned and sorted before it is ready for the market. In some places, especially Brazil, the bean is pulped by machinery as soon as it is taken from the tree, and thus the time necessary to get the coffee ready for market is shortened.

Some of the coffee-producing countries of the world to-day are Brazil, Colombia, the Philippines, Hawaii, Cuba, Porto Rico, Jamaica, Central America, and parts of Africa, Arabia, Java and Ceylon. Brazil has a larger coffee-bearing area than any other country; it produces more than two-thirds of all the coffee consumed in the world. Coffee planting in Brazil has been the most successful farming in the world. São Paulo, a city of 400,000, owes its prosperity to the trade in the coffee raised in the great orchards in the vicinity. What has made coffee growing especially profitable in Brazil is the "valorization scheme carried on by the Brazilian government, whereby it stores the coffee in warehouses when prices show a downward tendency, advancing the planters' loans on it as security. This practice was put an end to, so far as the United States was concerned, in 1913. In some of the orchards there are about 5,000,000 trees. Large quantities of the Brazilian coffee are shipped annually to Aden (Arabia) and reshipped to other parts of the world as mocha. The producing of coffee in Yemen, or Wady Negram, or anywhere near Mocha is a thing of the past; but one kind of coffee berry raised in Brazil and in some other countries much resembles in form and flavor the old market mocha. The red lands in the province of São Paulo, in Brazil, seem to be particularly favorable to the growth of the tree, and this section seems immune to the leaf disease which has destroyed the industry in Ceylon and in some parts of the West Indies. The preponderating volume of the coffee crop of Brazil makes its annual production a matter of world-wide importance, and with the seasonal reports of the condition and prospective yield of each Brazilian crop, account is taken of stocks on hand in the world's markets and new estimates made of the stocks held secretly in storage in Brazil, in order that a new price may be made. Within the last few years the Liberian coffee plant, which is a larger and harder variety, has been introduced into Ceylon. So far it has successfully resisted the leaf disease, so that it now seems likely that Ceylon may again be among the places producing an excellent quality of coffee. The names given coffee are usually those of the cities from which shipments are made.

The difference in taste of coffee as found in our markets is principally due to two causes: (1) the roasting to either a reddish-brown or a dark brown; (2) the picking of coffee when some berries are green, others red and still others a dark purple, the last being the ripe fruit. Thus we have three grades from each tree; add the difference in roasting, as mentioned, and we have six grades; then take the perfect berry, which is flattened on one side, and the spherical berry, the so-called mocha, and that gives 12 grades of coffee.

In Porto Rico coffee of excellent quality is raised. In the Hawaiian Islands also very good coffee is produced, and the orchards are increasing in size and number. Hawaiian coffee brings the highest price of any on the Pacific Coast. The importation of coffee from Porto Rico and Hawaii has increased greatly within recent years. In 1914 the imports from Porto Rico were 2,793,052 pounds, as compared to 372,427 in 1894. In 1914 approximately 3,500,000 pounds of Hawaiian coffee was consumed in the United States. In the Philippines there are splendid orchards, especially in the southern islands of the archipelago known as the Sulu or Jolo group. On the island of Jolo are fine coffee-trees that bear much earlier after planting than those of Brazil. There are tracts of land in the Philippines which are as favorable for coffee growing as any in Brazil, but the area that may be devoted to coffee farming is not so great.

The United States leads the world in the consumption of coffee. It is estimated that the people of the United States consume 10 pounds per capita, which is about three times as much as they consumed 50 years ago. The yearly consumption in Great Britain declined steadily during the last half of the 19th century. This is attributed to the adulterations which at one time were extensively practised. Probably few articles of food are subjected to so much adulteration as coffee. Substances of an entirely foreign nature are often palmed off as genuine coffee, or are offered as substitutes. Dandelion, parsnip, carrot and beet roots, beans, lupins, rice and various cereals, roasted and ground, have all been employed, and within recent years the manufacture of artificial coffee has been undertaken on a considerable scale, the material being mixed to a stiff paste and run through a machine for which patents have been granted, and from which it emerges in the shape of "coffee-beans," which, after drying and roasting, are well calculated to deceive the eye, though not the nostrils or palate. These adulterations can be readily detected, for genuine roasted coffee may be soaked in cold water indefinitely without the bean losing its smooth surface or hard, tough consistency, nor will it impart its color to the water; whereas chicory and other imitations become soft and spongy and render the water muddy. As far back as the '80s it was estimated that something like 18,000,000 pounds of various vegetable substances were annually sold as coffee.

In Medicine.— Many of the leading medical men of the day hold that the action of coffee on the body is due to two or three factors. If coffee is mixed with milk or cream, it gives a certain amount of nutritive matter; but its action is usually due to the volatile oils, and to the caffeine contained. The volatile oil, like others in this class, stimulates peristalsis; but taken too often and in too large quantities the oil contributes to the causation of a certain amount of gastric indigestion. The more delicate the aroma of coffee the less the oil, and the better from this standpoint. The action of caffeine is much more complex.

So far as coffee-drinking is concerned, the action of caffeine is that of a cardiac stimulant, a nerve-muscle excitant, a diuretic and a cerebral excitant. Thus it may cause a sense of undue fullness in the blood vessels. It almost invariably causes a slight muscular tremor, which is noted in those who use their hands for fine work, as artists, for example. It causes an increased flow of urine, and tends to prevent sleep. Time, custom, usage, dose and the individual's reaction all modify these general laws; but these reactions occur, although none of them may be of sufficient grade to make the observer cognizant of the action. Thus many people are not kept awake by coffee. They have probably habituated themselves and require larger doses.

Hot coffee is one of the best heart tonics known, and it is sometimes administered in large quantities in cases of shock, opium poisoning, pneumonia, etc. Coffee is also valuable in many types of headache and in many cases of nausea. Its excessive use leads to great muscular irritability, gastritis, restlessness and sleeplessness. It is held by many medical men that the effects of coffee as a beverage are wholly bad. They say that the caffeine in the coffee, or in other vegetable substances—tea, coffee, kola, guarana and maté, or Paraguay tea — is a stimulant to the brain, nerves, heart and kidneys. In small doses it helps to resist fatigue, increases mental power and promotes excretion of urine. Large doses or continued use, however, tend to make a person nervous, to induce irritability of the heart, with considerable depression, and to upset the stomach. The mildest results of an overdose are a tendency to wakefulness, but there are recorded a number of deaths from heart-failure due to its employment in large doses. It is used largely as a heart-stimulant and diuretic, but its action is characterized by great variability. Individual susceptibility to it varies so greatly that what would be a poisonous dose to one person would scarcely affect another. The usual dose is half a grain to three grains.

History.— The early history of coffee is obscure; as an article of diet, its introduction is recent; to the Greeks and Romans it was wholly unknown. It was first introduced into Persia from Abyssinia, and next in the 15th century by a Mohammedan priest at Aden. From Aden it was carried to Mecca, where first the pilgrims or Hadjis, and then the rest of the people, began to use it. From Arabia it was taken to Cairo, Egypt, where in 1511 it was prohibited because it was believed to be an intoxicant and came within the class of things forbidden as food by the Koran. The Sultan Causon removed the prohibition, and coffee passed along the coast by way of Syria and around to Constantinople. Again it was opposed as one of the articles not to be used as food according to the Koran. Thus its use was sometimes forbidden, sometimes allowed, for many years. The Turks are now immoderate coffee-drinkers.

Prior to the 18th century all the coffee used in Europe was brought from Arabia Felix via the Levant. In 1652 Edward, a merchant, in trade with Turkey, introduced coffee into England; in 1697 Van Horn introduced it into Batavia, and from there it was taken to France and the West Indian Islands. In 1754 Father Villaso, a Franciscan monk, took a plant to Rio de Janeiro and cultivated it in the garden of the monastery of Saint Anthony. This one plant was the means of introducing coffee into Brazil. See article BRAZIL: *Agriculture*.

The great increase of the coffee trade in the United States within the past few years is shown in the following table:

Year	Total importation	From Brazil	From Colombia
1913	852,529,498 lbs.	625,002,095 lbs.	87,176,447 lbs.
1914	1,001,071,873 "	725,800,529 "	99,189,096 "
1915	1,228,761,626 "	898,175,974 "	111,413,170 "

The total coffee stocks in Europe on 31 July 1916 amounted to 3,555,000 bags, of which 2,877,000 bags came from Brazil and 678,000 bags from other sources. These stocks were distributed as follows: Havre, 2,376,000 bags; Marseilles, 255,000 bags; Bordeaux, 90,000 bags; England, 601,000 bags; and the Netherlands, 228,000 bags.

Bibliography.— Cook, 'Shade in Coffee Culture' (United States Botany Division, Bulletin 25); Hangwitz, 'The World's Coffee Trade in 1898' (United States Consular Reports, Vol. LX 258); Hewitt, 'Coffee, Its History, Cultivation and Uses'; Lock, 'Coffee, Its Culture and Commerce in all Countries'; Caswell, 'Coffee Culture in Our New Islands' (in the *Overland Monthly*, new series Vol. XXXII, 459); and United States Bureau of American Republics, 'Special Report on Coffee Culture in Central and South America.'

COFFEE-BUG, an insect (*Lecanium coffeæ*), of the *Coccus* family (*Coccidæ*), very destructive in coffee plantations.

COFFEE-HOUSE, a house of entertainment where persons are supplied with coffee and other refreshments. Such houses were formerly the chief resorts of every class for purposes of conversation and information, and the meeting-places of politicians, literary men, etc. Constantinople is believed to have been the first European capital in which coffee-houses were instituted, the year of their establishment there being 1554 A.D. In 1650 the first one in England was opened in Oxford. Each particular house attracted a special coterie of visitors; and because newspapers had not yet come into vogue, these places became the centres of the spreading of news, political gossip, etc. They were patronized daily by the upper and middle class. They were suppressed by Charles II in 1675, but were soon allowed to be reopened. Consult Macaulay, 'History of England' (Vol. I, New York 1858).

COFFEE-NUT: COFFEE-TREE. See KENTUCKY COFFEE-TREE.

COFFER, in Modern as well as in Renaissance, Neoclassic and Classic architecture a recessed panel, usually octagonal or square. Such panels occurring most frequently in ceilings or on the inner surfaces of cupolas, domes, barrel vaults and the like, were, in original Roman construction — as in the dome of the Pantheon, where the background was gilded, in the Basilica of Maxentius, etc.— a sinking in the solid masonry; but in modern work coffers are often produced in lath and plaster, or other thin and cheap material. Coffers are either plain, as are those in the ceiling of the main room of the National City Bank, New York, or foliated, as those in the ceiling of the library of the Metropolitan Museum of Art, New York, the latter being ornamented with modified or conventionalized acanthus leaves.

COFFER FISH, or **TRUNK FISH,** a peculiar genus (*Ostracion*) of bony fishes in the small order *Plectognathi,* and in the suborder *Sclerodermi,* which also includes the file-fishes. The body is enclosed in a firm box formed of hexagonal bony scales fitted into one another like a mosaic. The snout, the bases of the fins and the end of the tail are the only soft-skinned parts. Over a score of species are known from tropical and subtropical seas. The best known form is *O. quadricornis* from the tropical Atlantic.

COFFERDAM, a water-tight enclosure round a space where it is intended to found the pier of a bridge, quay, etc., so constructed that the water may be pumped out of it and the masonry executed «in the dry.» It is formed of one or more rows of piles (usually two), between which clay is rammed. The piles, generally driven close together, are sometimes grooved and tongued; but if the water be not very deep the piles are placed some distance apart, and boards let into the grooves. Of course great care must be taken that no water can enter at the joints or at the junction with the natural soil, and that the structure is sufficiently strong to resist the great pressure of water from without. If the bottom is of rock, and piles cannot be driven, cofferdams may be formed of two parallel stone walls, the intervening space filled up with clay. Iron caissons are also used instead. Sheet steel interlocking piling is also extensively used in this form of construction. Consult Fowler, ‘Ordinary Foundations, Including the Cofferdam Process for Piers’ (New York 1905).

COFFEYVILLE, Kan., city of Montgomery County, situated on the Verdigris River, and on the Missouri Pacific, Atchison, Topeka and Santa Fé and other railroads. It has a public library. The city carries on an extensive trade with Oklahoma and has strawboard, planing and flour mills, railroad shops, oil refineries, a plow factory, glass factories, oil-well, packing plant, a large oxide smelter, foundry, vitrified brick works and a roofing-tile factory. The United States census of manufactures for 1914 recorded 45 industrial establishments of factory grade, employing 628 persons, of whom 497 were wage earners, receiving $356,000 annually in wages. The capital invested aggregated $2,092,000, and the year's output was valued at $3,788,000: of this $1,691,000 was the value added by manufacture. Coffeyville was incorporated in 1871 and adopted the commission form of government in 1909. The waterworks and electric-light plant are owned and operated by the municipality. Pop. 16,000.

COFFIN, Charles Carleton, American novelist and lecturer: b. Boscawen, N. H., 26 July 1823; d. Brookline, 2 March 1896. He began life as a civil engineer, and afterward gave his attention to telegraphy. In 1851 he began to write for the Boston papers; and during the Civil War and the Austro-Prussian War of 1866 was war correspondent for the Boston *Journal,* writing over the signature of «Carleton.» He was a member of the Massachusetts legislature (1884–85). His books include ‘Days and Nights on the Battle-Field’ (1864); ‘Four Years of Fighting’ (1866); ‘Our New Way Round the World’ (1869); ‘Story of Liberty’ (1878); ‘Boys of '76’ (1879); ‘Old Times in the Colonies’ (1880); ‘Life of Garfield’ (1883); ‘The Drum-Beat of the Nation’ (1887); ‘Marching to Victory’ (1888); ‘Freedom Triumphant’ (1891). Consult Griffis, ‘The Life of Charles Carleton Coffin’ (Boston 1898).

COFFIN, Sir Isaac, English admiral: b. Boston, Mass., 16 May 1759; d. England, 23 July 1839. He entered the English navy as midshipman in 1773, and served on various ships on the American station. On 16 March 1781 he acted as signal-lieutenant to Admiral Arbuthnot in the action off Cape Henry, and in 1782 was present as a volunteer under Admiral Hood in the engagement between Rodney and De Grasse. In 1798, when Minorca fell into the hands of the English, he was appointed superintendent of the arsenal at Port Mahon. In 1805 he was created a baronet; in 1814 he attained the rank of admiral. In 1826 he founded a school in Nantucket, Mass., still called by his name.

COFFIN, James Henry, American scientist: b. Williamsburg, Mass., 6 Sept. 1806; d. Easton, Pa., 6 Feb. 1873. He was graduated at Amherst 1828. He taught at Greenfield, Mass., Ogdensburg, N. Y., 1829–40; at Williams College 1840–43; Norwalk (Conn.) Academy 1843–46, when he was elected professor of mathematics and astronomy in Lafayette College, Easton, Pa., where he remained till his death. His reputation is due to his achievements in meteorology, a subject he began to investigate as early as 1838. He established an observatory on Mount Greylock, 4,000 feet above sea-level. For use there, he invented an anemometer. In 1853 he published his theory of atmospheric circulation, including the principle quoted in Europe since 1860 as ‘Buys-Ballot's Law.’ He wrote ‘Solar and Lunar Eclipses’ (1845); ‘Winds of the Northern Hemisphere’ (1853); ‘Psychometrical Tables’ (1856); ‘The Orbit and Phenomena of a Meteoric Fire-Ball, 20 July 1860’ (1869); ‘Elements of Conic Sections’ (1874); ‘The Winds of the Globe; or, the Laws of Atmospheric Circulation over the Surface of the Earth’ (1875), completed by his son, S. J. Coffin. Consult Clyde, ‘Life of J. H. Coffin’ (1882).

COFFIN, John Huntington Crane, American mathematician: b. Wiscasset, Me., 14 Sept. 1815; d. Washington, D. C., 8 Jan. 1890. He was graduated at Bowdoin 1834, and in January 1836 entered the United States navy as professor of mathematics, serving in the West India squadron, and at the Norfolk navy yard. He had charge of the mural circle in the Naval Observatory at Washington from 1843 to 1853, when he was transferred to the Annapolis Naval Academy, taking charge of the department of mathematics, and later astronomy and navigation. From 1865 to 1877 he had charge of the ‘American Ephemeris and Nautical Almanac.’ In 1877 he was placed on the retired list. Bowdoin conferred the degree of LL.D. upon him in 1884, and in 1863 he became one of the corporate members of the National Academy of Sciences, named by Act of Congress. He published 'Observations with the Mural Circle, with Formulas, Tables and Discussions, 1845–49,' published in the observatory volumes for those years; 'The Compass' (1863); 'Navigation and Nautical Astronomy' (1868); 'Observations of the Total Eclipse of the Sun, August 1869' (1884).

COFFIN, Joshua, American antiquary: b. Newbury, Mass., 12 Oct. 1792; d. there, 24 June 1864. He was graduated at Dartmouth College in 1817, and was a teacher for many years. Whittier was one of his pupils, and addressed to him the poem 'To My Old Schoolmaster.' Coffin was an ardent abolitionist, being a founder and first recording secretary of the New England Anti-Slavery Society 1832. He compiled 'Sketch of the History of Newbury, Newburyport, and West Newbury, 1635–1845' (1845); 'List of Some of the Descendants of Mr. E. Woodman (of) Newbury, Mass., 1635' (1855); 'The Toppans of Toppan's Lane: Their Descendants and Relations' (1862); 'An Account of the Principal Slave Insurrections in the Last Two Centuries' (1860).

COFFIN, Levi, American philanthropist: b. near New Garden, N. C., 28 Oct. 1798; d. Avondale, Ohio, 16 Sept. 1877. He was a farmer's son, and early evinced interest in the negro's welfare. In 1826 he settled in Wayne County, Ind., where he kept a country store. Proving successful in business, he actively aided slaves to gain freedom, largely through the «underground railroad.» Thousands of escaping slaves were aided on their way to Canada by him. He founded a store in Cincinnati for the handling of «free-labor goods» only. He helped found the Freedman's Bureau in 1863, and after the Civil War was active in schemes to advance the welfare of the colored people. He was known popularly as «President of the Underground Railroad.» Consult his 'Reminiscences' (Cincinnati 1876).

COFFIN, Lorenzo S., American philanthropist: b. Alton, N. H., 1823. He studied a short time at Oberlin College and taught in Geauga Seminary, Chester, Ohio, where J. A. Garfield and Lucretia Garfield, *née* Randolph, were his pupils. He served with the Iowa infantry during the Civil War. He became a preacher after the war and in 1883–88 was member of the Iowa board of railroad commissioners. He founded a Railroad Temperance Association, and was one of the founders of a Home for Aged and Disabled Railroad Men near Chicago in 1893. He was president of the Iowa Anti-Saloon League and in 1907 was the Prohibition candidate for governor and in 1908 was the candidate of the United Christian party for Vice-President of the United States.

COFFIN, Robert Barry, American journalist and miscellaneous writer: b. Hudson, N. Y., 21 July 1826; d. Fordham, N. Y., 10 June 1886. He was on the staff of the *Home Journal* of New York (1858), and was also art critic of the *Evening Post*. His humorous sketches, which appeared in many periodicals over the pen-name «BARRY GRAY,» have been extensively read. Among his publications are 'My Married Life at Hillside' (1865); 'Cakes and Ale at Woodbine' (1868); and 'The Home of Cooper' (1872).

COFFIN, William Anderson, American painter: b. Allegheny, Pa., 31 Jan. 1855. He was graduated at Yale 1874, studied art in the United States 1874–77, and then in Paris under Leon Bonnat 1877–82. He opened a studio in New York 1882, and has become well known as a painter of landscapes and figure pieces. In 1886 he won the Hallgarten prize of $200; was awarded a medal at the Paris Exposition 1889; received the Webb prize of the Society of American Artists 1891; and was gold medalist of the Philadelphia Art Club 1898. He was art critic of the New York *Evening Post* 1886–91, and of the New York *Sun* 1896–1900. In 1901 he was director of fine arts at the Pan-American Exposition in Buffalo, N. Y. At the Saint Louis Exposition (1904) he exhibited 'Sunrise in Winter' and 'Evening, Somerset Valley.' He is member of the Society of American Artists and of the Architectural League of New York; he won a silver medal, Charleston Exhibition (1902), and two silver medals at Saint Louis World's Fair (1904); was appointed member of New York Advisory Board to the Art Department of the Panama-Pacific International Exposition, San Francisco (1915); appointed by French government (1915) attaché honoraire French commission to Panama-Pacific International Exposition (1915); member of honor of the Société des Artistes Français, Paris; and member of honor of the Société Nationale des Beaux-Arts, Paris; appointed chairman (1915) of the American Artists' Committee of One Hundred in charge of Relief Fund for the Families of French Soldier-Artists. Among his best-known pictures are 'The Rain,' in the Metropolitan Museum; 'Une académie de peinture moderne'; 'An Examination' (time of Louis XIII); 'The Close of Day' (1881); 'The Hayfield' (1886); 'September,' in the National College, Washington, D. C.; 'A Maple in Blossom,' Municipal Gallery, Venice, Italy; 'At Break of Day,' Buffalo Free Arts Academy; 'October Morning,' and 'A Thunder Shower,' Brooklyn Institute of Art and Sciences.

COFFIN, a box or case designed to hold a corpse for interment or cremation. Coffins were used by the ancients mostly to receive the bodies of persons of some distinction. Among the Romans it was latterly the almost universal custom to consume the bodies with fire, and deposit the ashes in urns. Even at the present time coffins are not used in the East, either by Mohammedans or Christians. In Egypt coffins seem to have been used in ancient times universally. They were of stone, earthenware, glass, wood or a kind of pasteboard made by gluing cloth together. (See SARCOPHAGUS). Coffins among Christians were probably introduced with the custom of burying. (See BURYING-PLACES). The Plains Indians merely wrapped the body tightly in a buffalo robe. Other tribes constructed «houses of the dead,» in which the corpse, fully dressed in his best, was placed. Maritime folk often bury their dead in canoes. See CREMATION.

COG-WHEEL, a wheel with cogs or teeth. See WHEEL-GEARING.

COGGESHALL, England, town in the county of Essex, 42 miles northeast of London, on the left bank of the Blackwater. The place was once famous for the manufacture of a kind of baize, celebrated under the name of «Coggeshall whites.» It has manufactures of velvet, silk and isinglass. Pop. of parish 2,365. The hamlet of Little Coggeshall is on the opposite side of the Blackwater, which is crossed here by an ancient bridge of three arches, said to have been built by King Stephen, who founded here also an abbey for Cistercians.

COGHETTI, cō-gĕt'ti, **Francesco**, Italian painter: b. Bergamo, 4 Oct. 1804; d. Rome, 21 April 1875. He studied under Diotti di Castalmaggiore and Camuccini in Rome and was a profound student of Raphael. He settled in Rome and was for a number of years president of the Academy of San Luca. He is best known by his masterly frescoes in the basilican church at Savona. He adorned several Roman palaces with frescoes, and was knighted for his 'Condemnation of Saint Stephen.'

COGHLAN, kŏg'lạn, **Charles Francis**, American actor: b. Paris 1841; d. Galveston, Tex. 27 Nov. 1899. He was born of Irish parents, was educated for the bar in London, but went on the stage, making his American début in 1880 as Captain Absolute in 'The Rivals.' He took leading parts for many years, being a refined and capable impersonator of old school gentlemen. He wrote 'Jocelyn'; 'Lady Barter'; and other plays.

COGHLAN, Joseph Bullock, American naval officer: b. Frankfort, Ky., 8 Dec. 1844; d. New Rochelle, N. Y., 5 Dec. 1908. He was graduated in 1863 from the United States Naval Academy, and he at once saw service as ensign in the Civil War; in 1868 he rose to be lieutenant-commander, and later served successively on board the *Richmond, Saugus, Monongahela* and *Indiana*. In 1882 he was promoted commander, and in 1896 captain. As commander of the *Raleigh* of the Asiatic station from 1897, he took part in the battle of Manila Bay, 1 May 1898. On 2–3 May he commanded expeditions for the reduction of all Spanish batteries at the mouth of the bay, and on 7 July an expedition for the capture of Isle Grande, Subig Bay, Luzon. He was commissioned rear-admiral in 1902 and appointed to command the Caribbean squadron of the North Atlantic fleet 1902–04; was appointed commandant of the New York navy yard, 1904, which important post he held for two years, retiring in December 1906.

COGHLAN, Rose, American actress: b. Peterboro, England, 1853. She is a sister of the late Charles Coghlan, played soubrette parts at the Theatre Royal, Cheltenham, later becoming leading lady, went to London and traveled through the provinces in burlesque and comedy. She came to the United States in 1872 with Lydia Thompson and soon after joined E. A. Sothern. She returned to England and supported Barry Sullivan and in 1880–89 was leading lady with Wallack. She has starred since then in various companies in the United States and England, became a naturalized citizen of the United States in 1902 and engaged in stock raising in Montana. Consult Strang, 'Famous Actresses of the Day in America' (Boston 1899).

COGHLAN, Timothy Augustine, Australian statistician: b. Sydney, New South Wales, 9 June 1856. He was educated in his native city and in 1884 became assistant engineer for rivers and harbors. In 1886–1905 he was government statistician for New South Wales. He was also registrar of friendly societies 1886–1905, and chairman of the board of old age pensions 1901–05. He served on various royal commissions, was president of the conference of Australian and New Zealand statisticians to determine number of representatives in each state in the Federal Parliament and to arrange for uniformity in the census of 1901. In 1902 he was president of the Australian Society for the Advancement of Science. He has published 'Wealth and Progress of New South Wales'; 'Picturesque New South Wales'; 'The Seven Colonies of Australasia'; 'Discharge of Streams in Relation to Rainfall'; 'Childbirth: a Study in Statistics'; 'Notes on the Financial Aspect of Federation'; 'Report on the Eleventh Census of New South Wales'; 'Deaths of Women in Childbirth'; 'Child Measurement'; 'Decline in the Birthrate of Australia and New Zealand'; 'Statistical Account of Australia and New Zealand.'

COGNAC, kōn-yăk, in southwest France, in the department of Charente, on the Charente River, 22 miles west of Angoulême. It is situated on a hill crowned by an old castle. It contains a 12th century church, was a Huguenot stronghold, and suffered much in the religious wars of the 16th and 17th centuries. It is famous for the brandy which bears its name and which is exported to all parts of the world, chiefly to England, the north of Europe and America. Some English houses, established here in 1780, began the manufacture of this brandy and developed its enormous trade. Pop. 19,188.

COGNIET, kōn-yā, **Leon**, French historical and portrait painter: b. Paris, 29 Aug. 1794; d. there, 20 Nov. 1880. He studied under Guerin, obtained the Grand Prix de Rome in 1817 and became a member of the Institute in 1849. His first picture of note was 'Marius among the Ruins of Carthage' (1824), now in the Museum of Toulouse. His other works include 'the Massacre of the Innocents,' and his masterpiece, 'Tintoretto Painting the Portrait of His Dead Daughter' (1845) in the Bordeaux Museum. Of his portraits may be mentioned the 'Maréchal Maison,' 'Louis Philippe' and 'M. de Crillon.' He decorated several ceilings in the Louvre and the Halle de Godiaque in the Hôtel de Ville, Paris, and a chapel in the church of Madeleine. At first he painted in classical style, but later adopted the methods of the Romanticists. His pictures are careful in composition but lack imagination and strength of color. Many famous artists of a later day were pupils in his studio.

COGNIZANCE, an old term in common law signifying legal jurisdiction or acknowledgment of a fact entailing certain legal consequences. The term is used in the United States to signify a general sense of jurisdiction as in the phrase «to take cognizance of a cause of action.» In pleading, cognizance signifies a formal acknowledgment of an act alleged. In former times cognizance of pleas was jurisdiction of causes, a privilege granted by the king to a city or town to set up a tribunal for the trial of suits. The term is also used in heraldry to signify some distinguishing mark as a crest or badge.

COGNOVIT, in law, a written confession given by the defendant that the action of the plaintiff is just, or that he has no available defense.

COGSWELL, Joseph Green, American librarian and bibliographer: b. Ipswich, Mass., 27 Sept. 1786; d. Cambridge, Mass., 26 Nov. 1871. He was graduated at Harvard in 1806 and practised law for a few years in Belfast, Me. He was a tutor at Harvard 1813–15 and after four years of study in Europe he was made professor of geology and mineralogy and librarian at Harvard. In 1823, in connection with George Bancroft, he founded the famous Round Hill school at Northampton, Mass., the plan and methods of instruction being based on an examination of the best English and German systems of education. The school was discontinued in 1836. After a period of editorship of the New York *Review*, Cogswell, with John Jacob Astor, Fitz-Greene Halleck and Washington Irving, formulated the plan of the Astor Library. Cogswell was appointed its chief (1848), a place for which his remarkable attainments as a bibliographer eminently qualified him. He went abroad to purchase books and laid the foundation of the present collection with rare discrimination and economy. He presented to it his own fine collection of bibliographical works and prepared a catalogue of its contents. Advancing years caused his retirement in 1861. He was a frequent contributor to the leading reviews, such as the *North American Review, Backwoods* and the *Monthly Anthology*. Consult Ticknor, 'Life of Joseph Green Cogswell as Sketched in his Letters' (Cambridge, Mass., 1874).

COGSWELL, Mason Fitch, American physician: b. Canterbury, Conn., 28 Sept. 1761; d. Hartford, Conn., 10 Dec. 1830. He was adopted by Samuel Huntington, president of the Continental Congress and governor of Connecticut, and was graduated valedictorian at Yale 1780. He studied medicine with his brother James, at the soldiers' hospital in New York during the Revolution, and eventually became one of the best known surgeons in the country. He was the first in the United States to remove a cataract from the eye, and to tie the carotid artery (1803). Mainly through his influence the first asylum for deaf-mutes was founded in this country at Hartford, and his daughter Alice was its first pupil. He was also a founder of the Retreat for the Insane in the same city.

COHABITATION, the act of a man and woman in living together as husband and wife. It does not necessarily include the notion of sexual intercourse between the parties, but is commonly held, even in law, to do so, and this is always the case when the parties are unmarried. Applied to husband and wife it may mean only *consortium*. Cohabitation raises a legal presumption of marriage between the parties cohabiting, which may be rebutted by other evidence. See MARRIAGE.

COHAN, George Michael, American comedian and playwright: b. Providence, R. I., 1878. When nine years old he appeared in 'Daniel Boone' and later with other members of his family toured the country as "The Four Cohans." They were among the greatest attractions on the vaudeville stage. From 1899 to 1914 George M. Cohan wrote and produced a great number of musical comedies, usually appearing himself in the principal part. These plays included such successes as 'Little Johnny Jones'; 'The Governor's Son'; 'Forty-Five Minutes from Broadway'; 'George Washington, Jr.'; 'The Yankee Prince'; 'Get-Rich-Quick Wallingford'; 'Broadway Jones'; 'Seven Keys to Baldpate.' In 1914 Mr. Cohan retired from the control of his several theatres in New York to devote himself exclusively to writing and composing.

COHEN, Alfred J. See DALE, ALLEN.

COHEN, Emil, German mineralogist: b. Jutland 1842; d. 1905. He was educated at Berlin and at Heidelberg and was assistant in mineralogy at the latter university in 1867–72. In 1872–73 he traveled in South Africa and after his return spent some years in preparing accounts of his exploration there. In 1878 he became professor of petrography at Strassburg, and in 1885 was appointed to the chair of mineralogy in Greifswald. He published 'Geognostisch-petrographische Skizzen aus Südafrika' (1874); 'Erläuternde Bemerkungen zu der Routenkarte einer Reise von Lydenburg nach den Goldfeldern und von Lydenburg nach der Delagoabai im östlichen Südafrika' (1875); 'Sammlung von Mikrophotographien zur Veranschaulichung der mikroskopischen Struktur von Mineralien und Gesteinen' (1883; 3d ed., 1899); 'Meteoritenkunde' (2d ed., 1903).

COHEN, Henri, French numismatist: b. Amsterdam, Holland, 1808; d. 1880. He was for several years curator of the numismatic collection in the National Library in Paris. He wrote several valuable works including 'Description générale des monnaies de la république romaine' (1857); 'Description historique des monnaies frappées sous l'empire romain' (7 vols., 1868; 2d ed., prepared by Feuardent, 1880 et seq.); 'Guide de l'amateur de livres à vignettes du XVIIIe siècle' (1870; 5th ed., 1886). Cohen enjoyed also a reputation as a composer and writer on the theory of music.

COHEN, Henry, American rabbi: b. London, England, 7 April 1863. He was educated in London, was ordained rabbi in 1884 and held pastorates at Kingston, Jamaica, 1884–85, Woodville, Miss., 1885–88, and Galveston, Tex., since 1888. He is honorary vice-president of the Jewish Publication Society of America. He has published 'Six Hundred Talmudic Sayings' (1894; 2d ed., 1910); 'Prayer in Bible and Talmud' (1894); many pamphlets on historical and biblical subjects. He contributed nine articles to the 'Jewish Encyclopedia.'

COHEN, Hermann, German philosopher: b. Koswig 1842. He was educated at Breslau, Berlin and Halle, and in 1875 was appointed professor at Marburg. He is a prominent leader of the Neo-Kantian school and his interpretations of Kant's critical philosophy are of permanent value. He has done as much as any other to make Kant's writings popular with students. His writings include 'Kant's Theorie der Erfahrung' (1871; 2d ed., 1895); 'Kant's Begründung der Ethik' (1877); 'Platon's Ideenlehre und die Mathematik' (1879); 'Ein Bekenntniss und die Judenfrage' (1880); 'Kant's Begründung der Aesthetik' (1889); 'System der Philosophie' (1902–06); 'Kommentar zu Kants Kritik' (1907); 'Religion und

Sittlichkeit’ (1907). Consult Cassirer (in *Kant-studien*, Vol. XVII, 1912), and ‘Philosophische Abhandlungen, H. Cohen zum 70sten Geburtstag dargebracht’ (Berlin 1912).

COHEN, Jacob da Silva Solis, American physician: b. New York, 28 Feb. 1838. He was graduated M.D. at the University of Pennsylvania 1860, and in 1861 became assistant surgeon of the 26th Pennsylvania regiment, serving with the expedition to Port Royal and with the South Atlantic blockading squadron till January 1864, and subsequently acting assistant surgeon in army hospitals. In 1866 he settled in practice in Philadelphia, and has made a specialty of diseases of the throat and chest. He also accepted a professorship in the Philadelphia Polyclinic and College for Graduates in Medicine. He is now professor emeritus of diseases of throat and chest at Philadelphia Polyclinic and honorary professor of laryngology of Jefferson Medical College. He has written many important articles and books on these topics, chief of which are ‘Diseases of the Throat and Nasal Passages’ (2d ed., 1879); ‘The Throat and the Voice’ (1880); ‘Treatise on Inhalation’; ‘Croup in its Relations to Tracheotomy,’ and since 1880, 30 other special studies, which have been published in the New York *Medical Journal,* Philadelphia *Medical News,* etc.

COHEN, Katherine M., American artist: b. Philadelphia, 18 March 1859; d. Philadelphia, Pa., 14 Dec. 1914. Receiving her early training at private schools and at Ogontz, Pa., she displayed a taste for art which was developed by study at School of Design, Pennsylvania Academy of Fine Arts, Students' Art League under St. Gaudens, and six years in Paris schools. She was engaged in sculpture after 1880 and her chief works have been portraits and bas-reliefs, decorative works and paintings of figure and landscape. Among her principal successes have been Portrait of General Beaver for Smith Memorial, Fairmount Park; ‘The Israelite’; ‘Priscilla’; ‘Rabbi-ben-Ezra’; ‘Romola’; ‘Lorna Doone.’

COHEN, Mendes, American civil engineer: b. Baltimore, 4 May 1831; d. there, 13 Aug. 1915. Educated in private schools he soon displayed a bent toward engineering and engaged in practical study at the locomotive works of Ross Winans, Baltimore, 1847–51. His active service became continuous, first in the engineer corps of the Baltimore and Ohio Railroad 1851–55; then as assistant superintendent Hudson River Railroad 1855–61; and 1861–63, as president and superintendent Ohio and Mississippi Railroad (of Illinois). For some years he was engaged in the special service of the Philadelphia and Reading, and became comptroller and assistant to the president of the Lehigh Coal and Navigation Company. In 1894 he was appointed by President Cleveland as member of the board to examine and report a route for the Chesapeake and Delaware Ship Canal. In Baltimore he was long honored with important civic trusts.

COHEN, Solomon Solis, American physician: b. Philadelphia, 1 Sept. 1857. He was graduated from the Central High School in 1872 (with the degree of A.B.) and after some years of work as a bookkeeper and teacher studied medicine and was graduated from Jefferson Medical College in 1883. From 1888–1902 he was lecturer in, and since 1902 has been professor of clinical medicine at, Jefferson Medical College, and from 1889–1902 professor of clinical medicine and therapeutics at Philadelphia Polyclinic and College of Graduates in Medicine. He was president of the Philadelphia County Medical Society, 1898–99, and recorder of the American Association of Physicians, 1902–13. His published writings include ‘Therapeutics of Tuberculosis’; ‘Essentials of Diagnosis’; and he has edited ‘A System of Physiologic Therapeutics.’ He has written many papers for scientific societies and encyclopædias and has been on the editorial staffs of a number of medical journals. He has written much verse, including translations from mediæval Hebrew poets, published only in periodicals and anthologies. His most noted original poems are ‘I know that my Redeemer Liveth’; ‘At the Gates of God’; ‘When Love passed by’; ‘Love called Me not away’; ‘From Master to Master.’ He was one of the founders and editors of the *American Hebrew.* Wrote an essay, ‘A Menace to Freedom’ (*Arena* 1898) in warning and protest against proposed seizure of the Philippines, and was a founder and vice-president of the Anti-Imperialistic League; is an ardent advocate of Single Tax and has published a number of papers, especially ‘Tuberculosis: An Economic Problem,’ to show relation between taxation and health; ‘How to Keep Well’; ‘Hygienic Abstracts of the Mosaic and Rabbinic Legislation.’ He has written in favor of Zionism, and represented American Federation of Zionists in 3d Zionist Congress. He was a founder and trustee of Jewish Theological Seminary of America and is trustee of Gratz College.

COHERER, an electrical instrument, part of the receiver in Marconi's system of wireless telegraphy, consisting of a small glass tube about one and a half inches long, into which two silver plugs are tightly fitted. A small gap separates these plugs, and in this gap a mixture of nickel and silver filings is placed. See Electrical Terms; Telegraphy, Wireless.

COHESION, the force by which the various particles of the same material are kept in contact, forming one continuous mass. Its action is seen in a solid mass of matter, the parts of which cohere with a certain force which resists any mechanical action that would tend to separate them. In different bodies it is exerted with different degrees of strength, and it is measured by the force necessary to pull them asunder. Cohesion in liquids is very much weaker, the parts being disjoined with much more facility; and in substances existing in the gaseous form it is entirely overcome, the particles repelling instead of attracting each other.

Cohesion in bodies is weakened or overcome by two general causes — by the repulsion communicated by heat, or by the attraction which may be exerted by the particles of one body on those of another.

Heat communicated to a solid body always diminishes the force with which the attraction of aggregation or cohesion is exerted; if the heat be increased to a sufficient extent the cohesion is so far weakened that the body passes into the liquid form; and if carried still farther, the attractive force is still more completely overcome and the body passes into the gaseous state. See Gases, General Properties of.

The same effects are produced by the exertion of that attraction which unites the particles of one body with those of another. If a liquid be poured on a solid, it often happens that their mutual attraction is sufficiently powerful to overcome the cohesion of the solid; its particles are consequently disunited, to combine with those of the liquid, and it entirely disappears. This forms the process of solution (q.v.).

When these powers are withdrawn, cohesion resumes its force, but with results which are different, according to the circumstances under which this happens. When the attraction of aggregation is suddenly and forcibly exerted the particles are united, in general, indiscriminately, and according to no regular law. If a body which has been melted is suddenly cooled to a sufficient extent, it becomes solid and forms a mass of no regular structure or figure; or if its cohesion has been suspended by the chemical attraction exerted by another body toward it, and if this attraction suddenly cease to operate, the force of cohesion is resumed, and the solid substance appears in the form of a powder. This latter case forms the chemical operation denominated precipitation (q.v.). But if the force of cohesion is exerted more slowly the particles are united, not indiscriminately, but usually with regularity, so as to form masses of regular structure and figure, bounded by plane surfaces and determinate angles. This forms the operation of crystallization; and such masses are denominated crystals (q.v.). See Strength of Materials.

COHESION FIGURES. When small drops of various liquids lighter than water, and slightly soluble in it, are allowed to fall on the surface of perfectly pure water, the drops form curious figures on account of the differences between the capillary tensions of the air surfaces of the liquids. (See Capillarity). These are called cohesion figures. They were investigated by the late Mr. Tomlinson, the results of whose researches are published in various papers in the *Philosophical Magazine* since October 1861. Creosote, for example, forms a disc which sails about on the surface with a rapidly quivering motion. The figures last for a short time, gradually disappearing as the drop becomes dissolved in the water. The slightest impurity in either liquid changes the figure by altering the superficial capillary tension of the liquid. Hence Mr. Tomlinson proposed to observe the figure as a test of the purity of certain essential oils.

COHN, Adolphe, American educator: b. Paris, France, 29 May 1851. He was graduated from the University of Paris in 1868 and served as a volunteer in the French army during the Franco-German War from July 1870 to February 1871. In 1875 he came to New York and taught languages for some years, when his ability secured him a tutorship in French at Columbia University in 1882, in which he served as instructor for two years. He was instructor at Harvard 1884–85, and assistant professor in French 1885–91. In 1891 he became professor of Romance languages and literature at Columbia, which position he still holds. He is a singularly successful teacher, and many of his pupils hold posts of prominence. He delivered the lecture on French literature in the Columbia University Lectures on Literature 1911. In addition to numerous contributions to literary periodicals, he has published 'Voltaire's Prose' (with Woodward, 1897); 'Le Sage's Gil Blas' (with Sanderson, 1899); 'Montaigne' (in 'French Classics for English Readers,' 1907). He is editor, with Curtis Hidden Page, of a series called 'French Classics for English Readers.'

COHN, Ferdinand Julius, German botanist: b. Breslau 1828; d. 1898. He was educated at the universities of Berlin and Breslau, began his connection with the latter institution in 1850 and was appointed full professor there in 1871. He made several invaluable contributions to our knowledge of the physiology and morphology of plants. He made very careful studies of the lowest forms of plant life, which greatly aided the study of bacteriology. He also made a microscopic analysis of water. He wrote a very great number of papers on professional topics and the following works: 'Zur Naturgeschichte des Protococcus pluvialis' (1850); 'Untersuchungen über die Entwickelungsgeschichte der mikroskopischen Algen und Pilze' (1853); 'Die Wunder des Blutes' (1854); 'Anthrax' (1876); 'Neue Untersuchungen über Bakterien' (1872–75); 'Die Pflanze Vorträge aus dem Gebiete der Botanik' (2d ed., 1895–97). He also edited the *Beiträge zur Biologie der Pflanzen* and the *Kryptogamenflora Schlesiens.* Consult Cohn, Pauline, 'Ferdinand Cohn, Blätter der Erinnerung' (Breslau 1901).

COHN, Gustav, German economist: b. Marienwerder 1840. He received his education at Berlin and Jena. He made a tour of England in 1873 and there gathered material for his 'Untersuchungen über die englische Eisenbahnpolitik' (1874). He was made professor of political science at Göttingen in 1884 and in 1892 served on the Imperial Commission to investigate the business and rules of the Stock Exchange. He has written 'System der Nationalökonomie' (1885, 1898; Eng. trans. in the 'Economic Studies' of Chicago University); 'Zur Geschichte und Politik des Verkehrswesens' (1900); 'Zur Politik des deutschen Finanz-, Verkehrs- und Verwaltungswesens' (1905); 'Ueber die staatswissenschaftliche Vorbildung zum höhern Verwaltungsdienst in Preussen' (1900); and 'The Science of Finance' (tr. by Veblen, 1895).

COHNHEIM, kōn'hīm, **Julius Friedrich,** German pathologist: b. Demmin, Pomerania, 1839; d. 1884. He studied medicine at Berlin and Würzburg and other universities and joined the pathological institute of La Charité, Berlin. He became professor of pathology at Kiel in 1868. From 1872 to 1878 he was professor at Breslau and from 1878 until his death was professor at Leipzig. Cohnheim was the first to demonstrate that pus is composed largely of white blood corpuscles. He published 'Untersuchungen über die embolischen Prozesse' (1872); 'Neue Untersuchungen über die Entzündung' (1873); 'Vorlesungen über allgemeine Pathologie' (1880); 'Die Tuberkulose vom Standpunkte der Infektionslehre' (1881). Consult biography by Kühne in 'Gesammelte Abhandlungen von J. F. Cohnheim' (Breslau 1885) and Ponfick, 'Gedachtnisrede auf Cohnheim' (Breslau 1884).

COHOBATION, an operation in which a fluid is converted into vapor by heat, and is then condensed, but instead of being collected in a separate receiver, as in distillation, it is made to flow back into the heated vessel. It is employed to produce a change in the fluid by continued heating, but more frequently to subject some substance to the action of a fluid without either loss of the latter or the necessity of adding fresh quantities of it.

COHOES, kō-hōz', N. Y., city of Albany County, at the confluence of the Mohawk and Hudson rivers, near the debouching point of the State Barge Canal, and on the New York Central and the Delaware and Hudson railroads, nine miles north of Albany and opposite the northern part of the city of Troy. The Mohawk River has a fall of over 70 feet at this point, and supplies great power, making Cohoes a very important manufacturing community. The Mohawk River is crossed by a dam above the falls, and the water is supplied to the mills and factories by means of canals. The principal manufactures are hosiery and knit goods, foundry and machine shop products, paper boxes, lumber and planing mill products, patent medicines, saddlery and harness, printing and publishing, etc. The United States census of manufactures for 1914 recorded 106 industrial establishments of factory grade, employing 6,179 persons, of whom 5,781 were wage earners, receiving annually $2,792,000 in wages. The capital invested aggregated $14,649,000, and the year's output was valued at $11,706,000; of this, $5,136,000 was the value added by manufacture. The city has fine public buildings, schools, churches, well-paved streets, a modern sewer system, municipal waterworks and filtration plant and is connected with Albany, Troy and other neighboring cities by electric street railways. Cohoes was first settled by the Dutch, and for some time a portion of the city was included in the Rensselaer Manor. It was chartered as a city in 1870. Pop. 25,000.

COHORT, a division of the Roman army, the tenth part of a legion, containing three maniples or six centuries. The number of men varied with that of the legion, the 10 cohorts always containing an equal number. When the legion numbered 4,000 men, the cohort consisted of 60 triarii, 120 principes, 120 hastati and 100 velites, in all 400 men. The centurion of the first century of the first maniple of the first cohort was the guardian of the eagle or colors of the legion, and hence the first cohort was always regarded as superior in dignity to the others.

COHOSH, kō-hŏsh' (*Cimicifuga racemosa*), also called black snakeroot, is a plant belonging to the crowfoot family (*Ranunculaceæ*). Besides this species there are about four others also called cohosh, herb-christopher and rattlesnake herb, which are widely distributed from Nova Scotia and Anticosti, south to Georgia, westward to Missouri and northward to British Columbia. It is an erect perennial herb growing in the woods. The plant has powerful medicinal properties and is a valued remedy in rheumatism, epilepsy, etc. The blue cohosh (*Caulophyllum thalictroides*) is a powerful antispasmodic and emmenagogue. It is also a diaphoretic and diuretic, and has been used successfully in this country as an anthelmintic.

COIF (French *coiffe*) (1) the badge of serjeants-at-law, who are called serjeants of the coif, from the lawn coif which they wore under their caps when created serjeants. (2) The cap worn by women of religious orders, usually white, and worn under the veil. (3) The name sometimes given to the small cap worn by monks who have the tonsure.

COIMBATORE, kō-ĭm-bạ-tōr', or **COIMBETOOR,** British India, an inland district in the south of Madras presidency, with an area of 7,860 square miles. The country has on the west and south the Nilgiris and Anaimalais ranges, and on the north the Eastern Ghauts. On the east it is bounded by Salem and Trichinopoly. It is fertile, producing sugar, cotton, rice and tobacco; and well watered by several rivers. The climate is very malarious in some parts. The principal towns are Coimbatore, Erroad and Carroor. In 1799, on the death of Tippoo and the division of his territories, Coimbatore was ceded to the East India Company. Pop. 2,300,000.

COIMBATORE, British India, city and capital of the district of Coimbatore, situated at the foot of the Western Ghauts, on the river Noyel, 305 miles southwest of Madras by rail. It has wide streets, is well built and well drained, has an agreeable climate and is more suitable for the residence of Europeans than most Indian towns. Cotton-spinning, tanning and coffee-curing are among the industries. It suffered much in the wars waged with the British by the Mysore sovereigns, passing finally into British possession in 1799. Pop. 47,007.

COIMBRA, kō-ēm'brä, Portugal, capital of the province of Beira, on a hill above the Mondego River, here crossed by a stone bridge, 115 miles by rail north-northeast of Lisbon. Its streets are steep and narrow, its manufactures confined chiefly to earthenware and combs, and its interest consists mainly in its historical associations. The place derives its name from the Roman Conimbria, traces of which lie to the south; it was held by the Goths and from them passed to the Moors, from whom it was finally conquered in 1064 by Fernando the Great, aided by the gallant Cid. Coimbra was the capital of Portugal for about two centuries and a half from its erection into a kingdom in 1139, and many of the early kings are buried in and around the old town. Of the public buildings, the most noteworthy are the older of the two cathedrals, the church of San Salvador and the ruined convent of Santa Clara; across the river is the Quinta das Lagrimas, "House of Tears," where Inez de Castro was murdered. Pop. 18,424. The University of Coimbra, with the exception of the University of Lisbon (founded 1910), the only one in Portugal, was originally established at Lisbon in 1290, but was transferred here permanently in 1537. It has five faculties and some 1,400 students; attached to it are a museum, an observatory, a botanical garden, laboratory, hospitals and a large and valuable library.

COIMBRA, University of, a national university of Portugal and until 1910 the only university in that country. It was founded in

1290 by King Diniz at Lisbon. It was transferred to Coimbra in 1308, receiving at the same time a new charter. For the succeeding 80 years its seat was changed several times from Coimbra to Lisbon and back again to Coimbra. In 1380 it was settled at Lisbon, but in 1537 it was transferred anew to Coimbra where it has since remained. Camoens was one of its members in 1537. It is the only continental university which has preserved the mediæval academic dress. It has faculties of law, medicine, mathematics and philosophy, a library, hospitals, an observatory, museums and laboratories. There are about 1,400 students enrolled. Consult Braga, 'Historia da Universidade de Coimbra' (Lisbon 1892).

COIN, Spain, city in the province of Malaga, 18 miles west-southwest of the city of Malaga. Surrounded by vineyards and fruit groves, it consists of well-built houses, spacious and clean streets, three squares — in the centre of the largest square is a handsome fountain. The chief manufactures are linen and woolen fabrics, esparto mats, soap, paper, hempen shoes, wine and oil. The exports are cattle, grain and fruits. In the neighboring hills are marble quarries and jasper of all colors. Pop. 13,000.

COIN, a piece of metal, circulating as money with an official certified impression as to weight, fineness and value. United States coin as described further on is nine-tenths fine; that of Great Britain eleven-twelfths fine. The place where coin is manufactured is called a mint and it is always a monopoly exercised by an established government. The mint of the United States was authorized by Act of Congress 1792, and its general operations began in 1793. At that time the appliances of coinage were few and crude, the striking of coin being by the old screw hand-press and the annual output confined to narrow limits. It was not until 1836, when the mint was removed from Seventh street, Philadelphia, to more commodious quarters at Chestnut and Juniper streets, that improved appliances were introduced. At that time the steam-operated coining-press invented by M. Thonnelier, a Frenchman, was introduced, and greatly facilitated the process of minting. Twenty years later this press was remodeled and much improved, continuing in use for 14 years, when it was superseded by the perfected machines now in use. The introduction of the steam coining-press inaugurated the improvements which have made the mint of the United States one of the finest equipped mints in the world. From 1836 to the present time the progress of the mint has been largely experimental. New and improved machinery has been added from time to time and improved scientific processes have been adopted. The humid assay process for determining the fineness of gold and silver was introduced in the year 1836. The platinum apparatus for the assay of gold was introduced in 1867. This was an English invention and a great improvement upon the method formerly in use. Automatic machines for the separation of coin blanks into «standard,» «heavy,» «light» and condemned «light» pieces were introduced in 1877. Improved rolls for converting ingots into coin strips, as well as gas annealing furnaces, may be said to have completed the equipment of the mint.

The organization of the mint, under the original and subsequent Acts of Congress, and until 1873, provided for a director, located at the parent mint at Philadelphia, an assayer, melter and refiner, coiner and engraver of dies, with a necessary subordinate clerical force, the assayer, melter and refiner, coiner and engraver, being designated as «operative officers.» The director was subject to the orders of the Secretary of the Treasury. After the creation of branch mints and assay offices the heads of such institutions reported to the director at Philadelphia. By the Act of 1873 the mint was reorganized, with a bureau at Washington, where the director was located. The resident chief officer at the mint was by that Act designated as superintendent, ranking with the chief officers of the mints at San Francisco and at New Orleans and the chief of the assay office at New York. The chief officers of the branch mints and minor assay offices were designated as «assayers-in-charge,» reporting to the director at Washington. The mint service is now under this reorganized form. The superintendents and the operative officers are appointed by the President and hold their official positions at his pleasure.

The processes of the mint can best be considered under the head of routine. The mint purchases at its counter all gold presented in value not less than $100, providing the deposit is not too base for commercial conversion into coin or fine bars. All deposits are made with the weigh clerk at the weigh room, who carefully weighs the same on the delicate balances, which are adjusted to show variations of one-hundredth of a troy ounce. The weight is carefully recorded in the books of the weigh clerk and registrar of deposits, together with the description of the bullion and the name of the depositor, both officers being present and carefully noting the same. The deposit is then locked in a copper box and sent to the deposit melting room, where it is melted and cast in the form of a bar. From this bar the assayer cuts clips, weighing from 18 to 20 one-hundredths of an ounce, two clips being taken, one from the upper side at one end, the other from the under side at the other end. These clips are assayed separately to determine the homogeneity of the metal. This assay determines the proportions of fine metal in the bar, and upon this assay the money value is determined and the depositor is paid. The loss of weight by melting is carefully noted and recorded. A slight allowance is made after melting to the melter and refiner and the weight so established becomes the true weight. As soon as the fineness of a day's deposits is reported by the assayer, they are delivered to the melter and refiner, and by that officer sent to the refinery, where the silver is separated from the gold and the base metals eliminated wholly, only the precious meals being accounted for.

The next step in the conversion of bullion into coin is the assembling of the refined metal into «melts» of about 3,000 ounces to which sufficient copper is added to render the melted mass 900 parts fine, which is the standard fineness of United States gold and silver coin. When melted the metal is cast into ingots of the size proper for the production of the coin required. This alloy is rigidly tested by assay, and if found standard within the legal tolerance it is so declared, and the ingots are delivered to the coiner for conversion into coin. They are first taken to the rolls, «broken down,» annealed and delivered at the finishing rolls, where they are converted into coin strips of the requisite thickness for coin blanks. The strips are then taken to the cutting machines, where they are converted into coin blanks which go to the selecting tables for the elimination of imperfect pieces and fragments. The accepted blanks are then sent to the adjusting room, where, if gold, each piece is weighed, the heavy pieces being reduced by filing and brought within the limit of legal tolerance. If the blanks be silver they are passed through automatic selecting machines which separate them into standards, heavies, lights, within tolerance and condemned lights. The blanks are next passed into a machine and «upset,» or «milled,» which process so raises the edge of the piece as to protect the work on the stamped coin from abrasion. The blanks are then annealed, treated to a dilute sulphuric acid bath and cleansed and brightened, and when thoroughly dried are ready for the coining-presses. These presses work automatically, the only hand action being to fill the feeding tubes. The pieces are automatically seized by conveyers and centred between the obverse and reverse dies within a collar a little exceeding the piece in diameter. The impact of the dies, brought together by the operation of a toggle joint, forces the metal to flow to the full diameter of the collar, which is grooved inside, and puts a fine reeding upon the edge of the coin. The finished coin is then automatically passed on and is followed by others, the delivery for large coins being at the rate of 80 or 90 per minute. Dimes are struck at the rate of 100 and 120 per minute.

The standard, heavy and light coins are then separately counted by gauge and made into drafts of $5,000 each, if gold, and drafts of $1,000 each, if silver. As the standard weight of gold drafts of $5,000 is 268.75 troy ounces, the standard, heavy and light coins are mingled in due proportion to make that standard weight, no greater variation than one one-hundredths of an ounce being allowed. The standard weight of $1,000 in silver dollars is 859.375 ounces and of subsidiary silver 803.75 ounces, with a tolerance of two one-hundredths of an ounce. The perfected drafts are then weighed in the presence of the superintendent, enclosed in canvas bags and delivered to that officer. The mint balances are adjusted to the troy pound (5,760 grains) which is the mint unit of weight. This weight is a duplicate of the troy pound established by a royal commission in England in 1758, reaffirmed in 1838. It is kept in a special safe at the Philadelphia mint. In order to secure an exact conformity in weight and fineness of United States coin, a fixed number of coins is taken from every delivery, sealed in the presence of the superintendent and the assayer, and deposited in a receptacle called «the pyx,» each of those officers having a key, both keys being required to open the pyx. These reserved pieces await the assembling of the Assay Commission, annually appointed by the President to meet on the second Wednesday in February, when the pyx is opened and exhaustive tests of the weight and fineness of the contents are made.

Location and Equipment.— The principal mint of the United States is located on Spring Garden street, between 16th and 17th streets, Philadelphia. Other mints are at New Orleans, San Francisco and Denver. The equipment of the Philadelphia mint, which covers 58,000 square feet, consists of eight boilers of 1,200 horse-power capacity, for heating, ventilating and electric lighting. To avoid the transfer of power by shafting the machinery is chiefly operated by independent motors. The building is lighted by 4,000 incandescent and 16 arc lights. There are 51 telephones connecting the departments and various offices. A gas plant, capable of delivering upward of 20,000 cubic feet per hour, furnishes fuel for the melting, annealing and assaying furnaces. The ventilating is by fans operated by attached motors. The spacious melting department is equipped with 13 gas and 3 coal heated furnaces, with power topping machines. The coining department has 23 coining-presses with an average capacity of 110 pieces of finished coin, each, per minute; 10 milling or upsetting machines, each capable of an out-turn of an average of 500 milled blanks per minute; a full equipment of trains of break-down and finishing rolls; 8 strip annealing gas furnaces and 1 furnace for annealing blanks; 8 automatic presses for cutting blanks from coin strips; 6 automatic weighing machines for the separation of blanks into standard, heavy, light and condemned pieces, together with appliances for cleaning, whitening and drying blanks after annealing. The assaying department is equipped with every known appliance for determining the fineness of gold and silver, both by the platinum and the humid processes. The refinery operates largely the acid process of separating, but it has a plant for refining by electrolysis and the process has proved a success, considerably increasing the capacity of the refinery.

The engraving department provides all of the coin dies used in the mints of the United States. It has every facility for die-sinking, hubbing and annealing the steel from which dies are produced, as well as a geometric lathe for transferring designs. The department for the manufacture of medals of a national character is in charge of the engraver, who provides the dies. The medal department is equipped with three hydraulic presses of the respective capacity for exerting a pressure of 1,100, 400 and 300 tons. These powerful presses are operated by electric motors. The machine shop has every appliance for the construction or the assembling and finishing of all machinery used in the mint. There are 20 steel-lined vaults for the storage of coin and bullion and for the use of the operative officers. One of these vaults has a floor-space of 5,200 square feet, with a storage capacity of 112,000,000 silver dollars. Another has a floor-space of 4,160 square feet. Six others have each a floor-space of 2,562 square feet. The basement vaults are built wholly independent of the enclosing walls, with a free passageway around them. The doors are massive and provided with the finest locks procurable, to which time-locks are attached. More than 3,250,000 pounds of steel enter into the construction of these vaults. The vestibule is highly ornate, the corridor extending through the cross-section from east to west is finished in richly variegated marble and the main staircase is of white marble. The floors are of messanine, the symbolic panels in the vestibule of glass mosaic. The ceilings are finished in white and gold.

The cabinet, or museum, is in a spacious room at the head of the main staircase in the rotunda. It contains a fine collection of the coins of all nations, ancient and modern, a full line of medals of a national character and many rare medals of foreign countries. There is also a fine collection of curios, many of them collected in distant lands. The working capacity of the mint considerably exceeds the national demand for its product. Congress has therefore authorized coinage for other nations at a fair remuneration. Pursuant to this authorization the mint has coined much gold and silver, as well as copper and nickel coin, for several of the South American and most of the Central American states. Prior to the annexation, the mint at San Francisco coined money for the Sandwich Islands. Admission to the mint is free to the public on every working day between the hours of 9 A.M. and 2 P.M. The building is patroled day and night by an armed guard. See BANKS AND BANKING; BULLION; COINAGE; COINS, FOREIGN, AMERICAN EQUIVALENT OF; CURRENCY; DOLLAR; GOLD; GOLD STANDARD AND PRODUCTION; GOLD STANDARD BILL; LEGAL TENDER; MINT; MONEY; NUMISMATICS; SILVER.

JOHN H. LANDIS,
Former Superintendent of United States Mint, Philadelphia.

COINAGE, the process of converting an authorized alloy of the money metals into the circulable coin of the country. The metal is alloyed and cast into ingots of sizes suitable to the production of the denomination of the coins required. Thus, for the double eagles, our largest coin, the ingot is cast 12⅝ inches in length, 1½ inches in width and half an inch in thickness. Such an ingot weighs about 80 ounces troy, of the approximate value of $1,488. The ingots for the eagles are cast 11 15/16 inches in length, 1 5/16 inches in width and half an inch in thickness. The weight of such an ingot is about 62 ounces troy. The half eagle requires an ingot 12 inches in length, ⅞ inch in width and 7/16 inch in thickness. The ingots are taken to the break-down rolls in drafts of about 50 ingots, where they are passed through the rolls several times, according as they prove more or less malleable. If passed through the rolls six times the dimensions of a double eagle ingot will be increased to 26¼ inches in length, 1 9/16 inches in width and 7/32 inch in thickness. The broken-down ingots are then sent to the annealing furnace, heated by gas fuel to about 1,500° F. and being laid singly upon a carrier traveling the whole length of the furnace, remain until the strips become a uniform cherry-red. They are then removed and plunged into a bath of cold water to remain until cool enough to handle. The strips are then wiped dry and passed on to the finishing rolls.

The next step will depend upon the condition of the metal. Should it retain indications of the hardness and springiness resulting to the break-down process, it is subjected to a second break-down by being passed three or four times through the rolls. The malleability of the metal being sufficient, the strips are taken to the finishing rolls or «rolls of precision.» After being passed through these rolls four times the strips develop the required thickness and uniformity for the production of blanks. At this stage the double eagle strip attains a length of 47⅜ inches, a width of 1⅝ inches and is reduced to a thickness of 7/16 of an inch. For ease in handling the strips are now cut in half by multiple shears and delivered at the cutting presses, where test planchets are cut from several strips and weighed to determine if the strip, when converted into planchets (coin blanks), approximates to standard weight. The cutting presses are automatic. The strip is seized by a grip and drawn under a steel punch working in a matrix cutting the planchets at the rate of 80 each minute. The planchets are next cleansed and sent to the selecting table where the imperfect pieces are separated from the perfect and the latter are sent to an adjusting room. The adjusting consists in the careful weighing of each blank separately to ascertain if it corresponds to the standard weight and legal tolerance, the latter being for double eagles and eagles ½ grain per piece, and ¼ grain each for half eagles and quarter eagles. Pieces found in excess of legal weight and tolerance are reduced by filing the edges until they conform to the limit. Such pieces are placed by themselves and marked «heavies.» Pieces a little less than the standard weight, but within the limit of legal tolerance, are placed in another receptacle and marked «lights.» Those found of exact legal weight are placed in another receptacle and marked «standard.»

The planchets so adjusted are then taken to the milling machines by the operation of which a protecting edge is raised on each piece. This edge is to preserve the face of the coin from abrasion. When milled the planchets are conveyed to the cleaning room where they are annealed until of a cherry-red and then treated to a bath of dilute sulphuric acid, by which process they are thoroughly cleansed and brightened. The annealing of the planchets after the milling process having prepared them for the stamping, when cleansed and brightened they are washed in boiling water, dried by riddling in sawdust, when they are ready for the coining press. It will be understood that the three descriptions of blanks, namely: «Heavies,» «lights» and «standards»— have been kept separate throughout the processes, and are never mingled until the coiner makes up the drafts of finished coin for bagging. The planchets therefore go to the presses by those divisions.

The coining press used in all first-class mints is a wonderful exhibition of mechanical skill. Its frame is of cast-iron of several tons weight, with a central arch in which are placed the working parts. The frame combines stability and rigidity. The mechanism of the working parts is automatic. The setting of the dies is a work of precision and can be properly done only by a person, who, being a skilled mechanic, has reinforced his native ability by long experience. In order to set his dies properly he must take into account the condition of the metal to be stamped, whether it be soft and ductile or hard and brittle. Upon these qualities of the metal depends the distance apart of the dies at the moment of their impact upon the planchets. The blanks are fed into a vertical tube of equal diameter, and when the press is in motion automatic fingers seize the bottom planchet by its periphery and carry it forward to a collar, a little larger than the piece to be stamped. The piece drops into the collar, and a toggle joint causes the dies to approach each other and exert a pressure of about 160 tons upon the soft planchet. The planchet, being ductile, is by this pressure made to fill the entire space within the collar, which is grooved, and imparts the reeding to the edge of the coin. The finished coin is automatically released and falls into a pan below, to be followed by other coins at the rate of 90 or 120 per minute. The first number relates to large gold coins and silver dollars, the latter to small gold and small silver coins. It should perhaps be stated here that while the essential processes in coining are the same in all modern mints, the routine is not uniform. In the mint of the United States the coin after stamping is returned to the adjusting room and each piece weighed separately. The necessity for this arises out of the possibly defective rolling of the strip from which the blank is derived. The density of the metal varies somewhat, and there may be also defective sonority developed in the process of stamping. In order to secure sonorous coin it is sometimes the practice to ring every piece (this relates to gold coin and silver dollars), and if any fail to give the proper tone they are rejected and sent to the melting pot. The pieces which stand the test are then returned to the coiner for conversion into uniform drafts for delivery to the superintendent or other officer authorized to receive and hold coined money of the government.

As a matter of law and regulation the coiner is required to make up gold coin into drafts of $5,000 of the uniform weight of 268.75 troy ounces. As the weight of the pieces separately weighed are not uniform, though all within the limit of legal tolerance, the coin is separated by the adjusters into «heavies,» «lights» and «standard.» Gold coins may vary from one-fourth of a grain in the half and quarter eagles to one-half a grain in double eagles and eagles. The coiner takes «heavies,» «lights» and «standards» in such proportions as will make drafts of 268.75 ounces and mingles them in the delivery pans. The drafts are then weighed, after counting the pieces in detail, and being found of the required weight, are set aside for final delivery. The drafts must not vary to exceed one one-hundredth of on ounce above or below the standard weight of $5,000, stated in the foregoing. Before delivery to the superintendent the latter takes a good number of pieces at random from the proposed delivery and carefully weighs them. If found within the legal limit of tolerance the delivery is accepted; but if the weight of any piece proves it outside of that limit the delivery is rejected, to be weighed, readjusted and recounted. It is proper to say that such a necessity seldom arises.

The practice now is to adjust all silver coins, excepting dimes. Dollars are made in drafts of $1,000 of the weight of 859.375 ounces. These drafts are constituted of «heavies,» «lights» and «standard,» and the only variation from that standard weight is two one-hundredths of an ounce. Subsidiary silver coin is delivered in drafts of $1,000, of a weight of 803.75 ounces, with an allowance of two one-hundredths of an ounce for half and quarter dollars, which are adjusted, and one one-hundredth of an ounce for dimes, which are not adjusted. It will be seen that all of the processes involved in coining money are works of precision, from the breaking down of the ingot to the issue of the perfect coin. All must be rigidly calculated, nothing can be left to chance. The presence of any of the base metals, as well as of the rare and valuable ones, may destroy the ingot for coinage. Arsenic lead and antimony cause most of the unworkability of the money metals, but this disability is lessening through the process of advanced science.

Great advances have been made in the processes involved in coining as conducted in modern times. The substitution of the coining press operated by power for the hand screw press of olden times practically revolutionized the business. The introduction of automatic weighing machines for separating the blanks into «heavies,» «lights,» «standard» and «condemned,» has simplified the process of adjusting. In fact the silver coins, with the exception of dimes, are now separated by the automatic weighing machines. The very great improvement in rolls for producing the coin strips from the ingot has made this new and rapid mode of selection possible. The draw-bench, made necessary to cure the defects of the rolls, has practically disappeared. Constant trying has produced rolls of such precision that the thickness of a coin strip can be regulated to the thousandths if required.

The automatic selecting machine in use at the mint of the United States at Philadelphia was invented and constructed by Seyesse, an Austrian, at Vienna. The blanks are fed into the machine through a vertical tube the size of the diameter of the blank. The feed is automatic and the pieces are conveyed into minute balances finely adjusted to grains, and by a complex and ingenious arrangement of parts are, according to weight, whether light, heavy, standard or condemned lights, shunted into the conduits strictly according to their varying weights, and through these conduits, or ways, are delivered, each to its proper receptacle at the discharged end of the machine. The standard and the accepted light pieces are then ready for milling. The heavy pieces are adjusted by weighing on a delicate balance, and if found to exceed the legal tolerance are reduced by filing the edge of the piece. By this method the necessity for hand adjusting is minimized and the rapid production of coin greatly facilitated. Other automatic selecting machines are employed in the mints of foreign countries, but have not been found so satisfactory as the Austrian machine in this country.

One of the most difficult of the processes of coining has been the annealing process, because it is vital to the successful reduction of the ingot to the coin strip. Formerly the process was conducted in a furnace heated by wood fires. Much depended upon the fuel. Perfectly seasoned hard wood, preferably oak, was required for good work. In annealing gold strips in a wood furnace the strips were enclosed in copper canisters, sealed to air tightness, and remained in the furnace about three-fourths of an hour. Silver strips were sometimes subjected to the heat for an hour or more.

In all annealing of strips in the wood-fire furnaces the strips were superposed unavoidably, and it was not always easy to determine when the draft reached a uniform cherry-redness. Delays and refractory metal were common with the old method of annealing. Besides, the method was the reverse of economical, owing to oxidation of the metal.

In substituting the gas annealing furnace for the wood-fire furnace the work of rolling the metal soon became a work of precision. A considerable saving of time was also effected. The gas annealing furnace for strips has a heating chamber 10 feet in length, 17½ inches in width and 10 inches in depth. A score of hollow rolls, named «conveyers,» mounted on hollow shafts of cast-iron, are so ribbed as to divide the face into several parts conformed to the width of the strips. These ribs separate the strips and prevent superposition. The gas burners enter the heating chamber at the bottom and are in sections, in order to secure independent control. Through these burners a mixture of gas and air is injected along the whole length of the chamber. The strips to be annealed are placed on the rolls at the entrance of the furnace, the rolls are rotated by worm wheels and pass entirely through the chamber, to enter a hood at the discharge end of the furnace. In this hood the strips, now of a cherry-red, are met by a flame surcharged with gas to prevent oxidation. A spray of water is applied to the strips outside the hood to cool them before they reach the air. This prevents the oxidation of the copper with which the metal is alloyed. The process thus described occupies about six minutes, instead of the hour, or even more, by the wood-fire furnaces. The time required in annealing silver is about 20 or 25 minutes as to the larger denominations. Dimes, however, not being adjusted, and the coin strip being produced from the dollar ingot, require a more prolonged annealing. The improvement in annealing has made it possible to produce from the ingot strips as high as 83 to 96 per cent of standard blanks and blanks within the limit of tolerance, suitable for coining. This high percentage of good blanks is undoubtedly due to improved annealing and rolling. It is a higher percentage than has ever been secured when the defects in annealing and rolling were in part remedied by the draw-bench. As that machine is still employed in mints not strictly up to date, it may not be amiss to say, that in principle the draw-bench is a wire-drawing machine. As under the old mode of developing the ingot into the coin strip the ductility of the strip was not uniform, some parts being more refractory than others, and hence not reduced to a uniform thickness by the rolls, it was found necessary to pass the strips through a rigid die. The strips were then pointed so as to be firmly gripped by the nippers of the draw-bench which, retreating, drew the strip through the rigid die and gave it a uniform thickness, now imparted by rolls of precision without wasteful annealing. This improvement not only works a reduction of waste, but saves a delay between the finishing rolls and the cutting presses.

The largest gold pieces ever coined by the United States government are the 600 $50 pieces coined as mementoes of the Panama-Pacific International Exposition. Up to 30 June 1915, the gold coinage of the United States was, in number of coins: Double eagles ($20) 120,757,306; eagles ($10) 51,122,910; half eagles ($5) 77,421,791; quarter eagles ($2.50) 17,260,490; $3 pieces 539,792; $1 (gold) 19,814,837. The silver coinage totals: Standard dollars 578,303,848; trade dollars 35,965,924; standard half dollars 379,768,022; Columbian and other souvenir half dollars 5,110,000; quarter dollars 410,991,308; 20-cent pieces 1,355,000; dimes 733,837,547; half-dimes 97,604,388; 3-cent pieces 42,736,240; nickels 855,008,587. A 3-cent nickel piece and a 2-cent bronze piece have also been coined and a half-cent of copper. The cent has been coined in copper, nickel and for many years in bronze to the total of about 2,700,000,000. The total coinage of the country is in dollars $4,439,067,448.35. The principal foreign coins and their value in United States gold are: English, the sovereign or pound sterling, $4.86; French and Swiss franc, $0.19; German mark, $0.23; Russian ruble, $0.51; Italian lira, $0.19; Swedish and Denmark crown, $0.27; Netherlands florin, $0.40; Spanish peseta, $0.19; Argentine peso, $0.96; Brazilian milreis, $0.55; Chilean peso, $0.36; Japanese yen, $0.50; Indian rupee, $0.32. See COIN and its cross-references. Consult 'Coinage Laws of the United States'; Hepburn, 'History of Coinage and Currency in the United States' (New York 1903).

JOHN H. LANDIS,
Former Superintendent of United States Mint, Philadelphia.

COINS. See CURRENCY.

COINS, Foreign, American Equivalent of. — As the monetary value of national coins is subject to frequent change, it is impossible to prepare a statement which would correctly specify the value of any particular coin at any future time. As such changes are correspondingly slight, however, the following list of the coins of all nations will always be comparatively correct, the values in the moneys of account of the United States having been corrected by the director of the mint, United States Treasury Department:

Argentine Republic.— Gold coins: argentine ($4.824) and half argentine; silver coins: gold peso ($0.965) and its divisions: paper peso ($0.4245).

Austria-Hungary.— By a law passed 2 April 1892, the monetary system of Austria-Hungary was reformed on a gold basis, with the crown ($0.203) as a unit. The coins issued under the old system are still in circulation, however. They are, gold: eight florins ($3.858), 4 florins, ducat ($2.287), and 4 ducats; silver: florin ($0.5052) and 2 florins. The coins under the new system are, gold: the 100 crown piece ($20.20), 20 crowns ($4.052), 10 crowns ($2.03); silver: five crowns ($1.01); 2 crowns ($0.406); 1 crown ($0.203); nickel: twenty hellers ($0.0405) and 10 hellers; bronze: two hellers, or 1 kreutzer ($0.0040), and 1 heller.

Belgium.— Belgium being a member of the Latin Union, its monetary unit is the franc ($0.193), and its coins the gold 10 and 20 franc pieces and the silver 5 francs.

Bolivia.— The boliviano ($0.3893) is the theoretical unit of Bolivia. In 1906 a monetary law was passed providing for the adoption of a gold standard. The unit of account is the gold peso of one-fifth of a pound sterling ($0.97). Its coins, silver, are the boliviano, the 50, 20, and copper 10 and 5 centavo ($0.0211) pieces.

Brasil.— The milreis ($0.546) is the monetary unit of Brazil. Its gold coins are 5, 10 and 20 milreis pieces; its silver coins, ½, 1 and 2 milreis; nickel 1/10, 1/5 and 2/5 milreis.

Bulgaria.— The monetary unit is the lev ($0.185) which is supposed to correspond to the franc of other double standard countries. In fact, but few Bulgarian gold coins are in circulation, the necessary gold coins being supplied by foreign 10 and 20 franc pieces. The silver coins are the ½, 1, 2 and 5 leva pieces; the nickel coins are the 2½, 5, 10 and 20 stotinki ($0.0385), and there are copper coins of 1, 2, 5 and 10 stotinki.

Canada.— The gold dollar ($1) is the monetary unit. The silver coins are the 50, 25, 10 and 5 cent pieces. Penny (2 cents) and half penny pieces are in circulation.

Chile.— The value of the peso, the monetary unit, is

($0.365). The gold coins of the country are the escudo ($1.825), doubloon ($3.65), and the condor ($7.30). The peso and its divisions are coined in silver.

China.— The monetary system of China is in an extremely chaotic condition. The unit and sole official coinage is the copper cash, 11 of which are equal to one cent. The silver tael, or liang, varies in value in different parts of the country, as follows:

THE CHINESE TAEL

PLACE	Value	PLACE	Value
Amoy..........	$0.8146	Nankin........	$0.8061
Canton........	0.8122	Ninchwang.....	0.7640
Chefoo........	0.7792	Ningpo........	0.7832
Chin Kiang......	0.7958	Peking........	0.7832
Fuchau........	0.7536	Shanghai.......	0.7942
The Haikwan or customs tael...	0.8289	Swatow........	0.7942
		Takau.........	0.8198
Hankow........	0.7622	Tientsin........	0.7894

In Hongkong and Labuan, the "British Dollar" has the same legal value as the Mexican dollar.

Colombia.— The gold dollar ($1) is the monetary unit. Other gold coins are the condor ($9.647) and the double condor, and 2½ and 5 peso pieces. The silver peso ($0.9352) and its divisions are coined.

Costa Rica.— The gold colon ($0.465) is the unit of the country. Two, 5, 10 and 20 colon pieces are coined in gold; 5, 10 25 and 50 centimos ($0.2326) pieces in silver. Foreign gold is legal, but not foreign silver.

Cuba.— By a law of 1914 a new coinage issue was authorized; this includes a gold peso as the monetary unit. Gold coins are the 20, 10, 5, 4, 2 and 1 peso pieces; the 20, 10 and 5 peso pieces are of the same weight and value as the corresponding United States gold coins. Silver is coined in pieces of 1 peso, 40 cents, 20 cents and 10 cents, while nickel coins of 5, 2 and 1 cent pieces are issued. United States coinage is legal tender.

Denmark.— The monetary unit is the crown ($0.268) and gold 10 and 20 crown pieces are coined. The minor coinage, in silver and bronze, is represented by the 50 ore ($0.1247) and its divisions.

Ecuador.— The gold sucre ($0.487) is the unit, but the 10 sucre piece is the only gold coin. The minor coinage, the 10 and 5 real ($0.0467) pieces, is of silver.

Egypt.— The gold pound, representing 100 piasters ($4.943) is the unit, and 50, 20, 10 and 5 piaster pieces are also coined in gold. The silver coinage is represented by the 1, 2, 5, 10 and 20 piaster pieces.

Finland.— The markka ($0.193) is the monetary unit, and the gold coins are 20 and 10 markka pieces. The 50 penni ($0.0944) and the 10, 5 and 1 penni ($0.0019) pieces, in bronze, constitute the smaller coinage.

France.— The gold franc, valued at $0.193, is the unit of the country. Gold 5, 10, 20, 50 and 100 franc pieces, and silver 5 and single franc pieces are coined. The minor coinage is represented by the 50, 20, 10 and 1 centime ($0.0019) pieces.

German Empire.— The gold mark ($0.238), is the unit and 10 and 20 mark pieces are coined in gold. The 5, 2 and 1 mark pieces, the 50 pfennigs ($0.1039) and the thaler ($0.6928) represent the silver, the 5 pfennigs, the iron, and nickel, and the single pfennig the aluminum and bronze coinage.

Great Britain.— While the monetary unit for the colonies varies, that for Great Britain itself is the gold pound sterling ($4.8665). The pound sterling (the sovereign), and the half sovereign are coined in gold; the crown ($1.0872), half crown, florin ($0.4348), shilling ($0.2174), sixpence ($0.1017), four pence ($0.0724), three pence ($0.0543), and the two pence ($0.0362) in silver, with the penny ($0.02), half penny and farthing ($0.005) in bronze.

Greece.— The drachma ($0.193) is the monetary unit. Five, 10, 20, 50 and 100 drachma pieces are coined in gold, 5 drachma pieces in silver, 20 and 5 lepta ($0.0096) in nickel and 1 and 2 lepta pieces in bronze.

Guatemala.— The silver peso ($0.439) is the monetary unit and this coin and its divisions are coined in silver. This silver peso is not now current, the money in use being paper or fractional nickel and copper coin.

Haiti.— The gourde ($0.965) is the unit of the country; 1, 2, 5 and 10 gourde pieces are coined in gold, and the single gourde and its divisions in silver and nickel. The smaller coin is the bronze centime ($0.0096).

Hawaii.— Same as United States.

Honduras.— The peso ($0.439) is the monetary unit and this coin and its divisions are coined in silver.

India.— The pound sterling, or sovereign, is the standard coin of India, but the rupee ($0.324433) and its divisions is the money of account.

Italy.— The lira ($0.193) is the monetary unit. The 5, 10, 20, 50 and 100 lire pieces are coined in gold; 5 lire pieces in silver, while the 20, 10 and 1 centesimo ($0.0019) in nickel and bronze represent the minor coinage.

Japan.— The yen ($0.498) is the unit of the country. Gold 5, 10 and 20 yen pieces are coined; 10, 20 and 50 sen (100 sen = 1 yen), silver pieces, with 5 sen, 1 sen and 5 rin ($0.0024) pieces in bronze.

Liberia.— The only official coin of Liberia is the gold dollar ($1).

Mexico.— The silver dollar, valued at $0.498, has long been the monetary unit of Mexico, but a change to the gold standard, which has been established recently, gives the country a gold dollar of the value of about 50 cents. The several divisions and multiples of the dollar are also coined.

Netherlands, The.— The gold florin ($0.402) is the monetary unit. Gold 10 and 5 florin pieces are coined as well as ½, 1 and 2½ florin pieces in silver. The cent ($0.004) is of bronze.

Newfoundland.— The gold dollar of Newfoundland is valued at $1.014.

Nicaragua.— The gold cordoba ($1.00) is the unit, and 10, 5 and 2½ cordobas are of gold. Silver coins are the cordoba, the ½ and ¼ cordoba, 10 cents; and minor coins of nickel and copper.

Norway.— Same as Sweden.

Panama.— The balboa, valued at $1 in gold, is the monetary unit. At present no gold is coined, the only coin being the silver dollar ($0.50) and its divisions.

Paraguay.— The country has no coinage, but the silver pesos of other South American republics circulate there at the same value as in the countries where they are issued.

Persia.— The silver kran ($0.915) is the monetary unit. Gold ½, 1 and 2 tomans ($3.408) pieces, and silver ¼, ½, 1, 2 and 5 krans are coined. The copper coins are the chai ($0.0085) and the abassi, valued at 4 chais.

Peru.— The sol ($0.487) is the monetary unit. Gold libra ($4.8665) are coined, as well as the silver sol and its divisions.

Philippine Islands.— By act of the 57th Congress the authorized coins of the Philippines are silver pesos of 10, 20 and 50 centavos (cents) value, and of copper ranging from ½ cent to 5 centavos in value.

Portugal.— The escudo ($1.08) is the monetary unit and 2, 5 and 10 escudo pieces are coined in gold. The silver coins of this country are 1 escudo, and 50, 20 and 10 centavo pieces. Bronze coins are 4, 2, 1 and ½ centavo pieces.

Rumania.— The gold leu ($0.193), corresponding to the franc, is the monetary unit. Twenty and 10 and 5 leu pieces are coined in gold, single leu pieces in silver, and 20, 10, 5 and 1 bani ($0.0019) pieces in nickel.

Russia.— The ruble ($0.515) is the monetary unit. Gold imperials, valued at 15 rubles, and half imperials are coined. New gold coins are the 10 and 5 ruble pieces. The ruble, as well as the 50 and 5 copeck ($0.0187) pieces, are of silver, while the single copeck and a 5 copeck piece are coined in copper.

Salvador.— The silver peso ($0.3978) is the unit, and this coin and its divisions are coined in silver. Nickel coins in circulation are 5, 3 and 1 centavo pieces.

Santo Domingo.— In 1897 the United States gold dollar was adopted as the standard of value. A small amount of debased silver coin circulates as small change at the ratio of 5 to 1.

Serbia.— The dinar ($0.193) is the monetary unit. The 20 and 10 dinar pieces are of gold; the 5, 2, 1 and ½ dinar pieces of silver, while the 20, 10, 5 and 1 para ($0.0019) pieces, in nickel and bronze, represent the minor coinage.

Siam.— The monetary unit is the silver tical ($0.38). The other coins current are the dos (10 ticals), salung (¼ tical), 2 salung piece, and the juang (⅛ tical), 10 satang, 5 satang, satang (1/100 tical).

Spain.— The peseta ($0.193) is the monetary unit. The several divisions and multiples of the peseta are coined in gold and silver, while the minor coinage, ranging from one centimo ($0.0019) to 50 centimos, are of silver or bronze.

Sweden and Norway.— The gold crown ($0.268) is the unit, and 10 and 20 crown pieces are coined in gold. The silver coinage includes the 2 crown piece, the single crown and the 50 and 10 ore ($0.0241), while the single and the 5 ore pieces are of bronze.

Switzerland.— The gold franc, valued at $0.193, is the monetary unit. Gold 5, 10, 20, 50 and 100 franc pieces, and silver 5 and one franc pieces are coined. The minor coinage includes the 50, 20, 10 and single centimes ($0.0019).

Turkey.— The piaster ($0.044) is the monetary unit and the gold coins include the 25, 50, 100 (the lira), 250 and 500 piaster pieces. The single piaster and the 2, 5, 10 and 20 piaster pieces are of silver, while a piaster and the para ($0.0001) are of copper. The piasters, half piaster (20 para), quarter piaster (10 para), and ⅛ piaster (5 para), are of nickel.

Uruguay.— The peso ($1.034) is the only gold coin authorized in Uruguay, but the silver peso ($0.403) and its divisions are also coined. Nickel coins are 5, 2 and 1 centesimo pieces.

Venezuela.— The bolivar ($0.193) is the monetary unit. Gold coins are the old Spanish *onza* (80 bolivars) and 20 bolivars. Silver coins are 5 bolivar pieces (*fuerte*), 2½ bolivars, 2 bolivars, 1 bolivar, ½ bolivar (*real*), and ¼ bolivar (*medio*). Nickel coins are 0.125 bolivar (*locha*) and 0.05 bolivar (*centavo*).

See COIN and its cross-references.

COIR, the outer coating of the cocoanut, often weighing from one to two pounds; when stripped off longitudinally it furnishes fibres from which are manufactured matting, bagging, sails, ropes and cables. The general preparation is simple; after being soaked for some months in water the fibrous coats become soft; they are then beaten to remove the other substances with which they are mixed, which fall away like sawdust. The fibres thus cleaned are ready for being spun into long yarns, woven into sailcloth or twisted into cables. Cordage made of this material rots in fresh water and snaps in frost, but from the fact of its being strengthened by salt water, and its extreme buoyancy as compared with hemp cables, floating as it does in water, and also its great strength and elasticity, it is preferable in many respects to ropes of hemp. It has been proposed to employ it in the construction of deep-sea telegraphs, as being much cheaper and lighter than gutta-percha.

COIRE, kwăr, or **CHUR,** Switzerland, capital of the canton of the Grisons, on the rivers Plessur and Rhine, 74 miles from Zürich by rail, situated 1,950 feet above sea-level. It is irregularly built, and possesses many houses in the ancient style of architecture. The most remarkable buildings are the old Romanesque cathedral, partly dating from the 8th century, and the old Episcopal palace. Adjoining this is a lofty tower believed to be of Roman origin. Among modern buildings are a Protestant church, government buildings and a hospital. Not far from Coire the Rhine begins to be navigable for small vessels. Ruled by bishops in the Middle Ages, it entered the Swiss Confederation in 1498. Repeatedly in the hands of the Austrians, French and Swiss, in 1802 it was definitely united to the Swiss republic. Pop. 14,485.

COIT, James Milnor, American educator: b. Harrisburg, Pa., 31 Jan. 1845. He was graduated at Hobart College 1865, and was manager of the Cleveland Tube Works 1873–77. In 1876 he became master in natural sciences at Saint Paul's School, Concord, N. H., and was appointed acting head master there in 1904. He engaged in research work at the University of Munich in 1909, and later became head of the Coit School for American Boys in Munich. He is president of the American Red Cross Committee. He is a member of the leading scientific societies of the country and has published 'Manual of Chemical Arithmetic' (1866); 'Treatise on the X-Rays and Their Relation to the Medical and Surgical Sciences' (1897); 'Liquid Air' (1899).

COIT, Stanton, American lecturer on ethics: b. Columbus, Ohio, 11 Aug. 1857. He was educated at Amherst and Columbia colleges and Berlin University, and has for many years lived and lectured in London, England, where he is chairman of the West London Ethical Society. In 1910 he was Labor candidate for Parliament from Wakefield. He was editor of the *International Journal of Ethics* 1893–1905, and has done much for the organization of the English ethical societies, especially in compiling 'The Message of Man: A Book of Ethical Scriptures' (1902); an 'Ethical Hymn Book' (1905); 'Responsive Services' (1911); and 'Social Worship' (1913). He has published in German and Dutch, 'The Ethical Movement in Religion' (1890); in English, German and Dutch, 'Neighborhood Guilds'; 'National Idealism and a State Church' (1907); 'National Idealism and the Book of Common Prayer' (1908); 'Woman in Church and State' (1910); 'The Soul of America' (1913); 'The Spiritual Nature of Man' (1910).

COITUS, the act to permit fertilization of the ~~female.~~ In the higher animals this takes place by the insertion of the male organ — the penis — within the female organ — the vagina. In many lower animals male secretions — spermatozoa — simply mingle with or mechanically come in contact with the female ova. Thus in the fish the ova are deposited in a sort of a crude nest; the male, swimming above the nest, discharges the spermatozoa over them and impregnation of the egg takes place. In the human animal the process is quite complicated, and since much human happiness is bound up in a properly performed sexual act a correct knowledge of its physiology should be made available. The sexual act may be divided into three stages: (1) desire, (2) erection and excitement and (3) ejaculation or orgasm. In the human being sexual desire is present from the moment of birth although it rarely enters into consciousness as such and is partially distributed into polymorphous trends to all parts of the body, being inextricably compounded with nutritional desires, with desires for movement, for urination, for defecation, etc., etc. In this phase of its evolution the primary instinct for reproduction has not obtained any conscious direction, nor found a proper object nor appropriate method. Every sense organ of the body seeks gratification to satisfy its own needs — these are pursued with much vigor by the child but are rarely directed toward an external object. In many children, perhaps most, genital manipulation causes local excitement, but this genital excitement is only a part of the general infantile reaction of reaching out for pleasurable sensations. Nevertheless the chief disturbances which later come to make the sexual act non-satisfying, or perverse in its trends, can be traced back to faulty adjustments of the values of these early infantile polymorphous trends. As one instance of many such faulty adjustments the perversion known as sodomy, in which the rectum is used as a substitute for a vagina, can often be traced back to severe constipations or diarrhœas in infancy, worms or too many enemas, so that the rectum becomes the seat of an exaggerated series of pleasurable excitements, the retention of the memory of which may divert the adult interest away from the physiological goal, the vagina. For the most part, and in the adult whose sexual adaptation takes a proper course — the infantile pleasurable trends just spoken of become harmonized, are largely put away by a complex series of repressions and remain latent sources of higher types of creative performance.

Thus in the more healthy types the reproductive function desire only reappears, and then more consciously, at about the time of puberty. Even then repression is constantly operative and that which is socially under a ban is diverted to other constructive activities. Desire is now evoked by a series of changes, chief of which are physical, but also conditioned by the presence of the internal secretions of the testes and ovaries. By some it is thought that in the absence of these internal secretions the psychical associations, which may be denominated the love associations, are unable to bring about sexual excitement and its consequent erection and orgasm; this is true for most cases probably, as in eunuchs who have been castrated, but still it is known that it is not invariably so, since some castrated individuals are sexually very active. Furthermore, there are many individuals, who, with absolutely intact glands and healthy internal secretions, nevertheless are very impotent from various types of psychological blocking. Some are cured of this by proper psychotherapy. Thus all that can be said is that the physical and mental here as well as everywhere else in the body are interdependent one upon the other. There are innumerable pathways for the psychic stimuli which lead up to sexual desire. No two individuals are just alike in this regard. Sometimes the early infantile smelling trends determine certain odors as the specific stimuli for the bringing out of desire, with others eye stimuli, others sound stimuli, again touch stimuli, in others urinary or rectal stimuli are the essentials. These are all unconscious associations which have been built up from the earliest infantile period. In fact for some even intrauterine stimuli are known to have determined certain abnormal trends in this difficult field of the reproductive instinct. Whatever the stimulus or series of stimuli, whether they come from the external world or arise within the body itself, the impressions are carried by certain nerve pathways down the spinal cord to reach the spinal centres, or reflex arc pathways, the integrity of which permits the second essential in the reproduction act, erection. Up to this point male and female act alike — save the influence of the menstrual cycle as a specific stimulus to desire in the female, largely missing in the majority of males. There is probably no more difficult subject of investigation and one in which so many variations may be found as to what shall determine sexual desire. Within its realm lie all the mysteries of «falling in love,» the «choice of the partner,» the happiness and tragedy of human marital relations. Even the structure of society is intimately bound up in this the unconscious sexual life of the child. This is only just beginning to be understood as the preposterous taboo upon the mystery of sex is gradually being lifted and prudery and hypocrisy are giving way, very slowly, to honesty and real enlightenment.

(2) Erection. The physiological nervous mechanisms consist of nerve fibres which establish a complicated series of reflex arcs which acting upon the blood vessels of the corpora cavernosa of the penis bring about its erection. Two factors are prominent in this blood vessel control. There is an active dilation of the small and medium sized blood vessels, so that from 8 to 10 times as much blood enters the penis, and secondly the return of this blood to the venous channels is partly prevented by the contraction of certain fibres of the ischiocavernosus or erector penis muscle which shut off the dorsal vein of the penis. Psychical stimuli after passing down the spinal cord to the lumbar region are switched off, as it were, through cerebro-spinal nerves which make up the nervus erigens to the muscles of the penis. The peripheral reflex paths, which carry impressions from the skin and mucus membrane of the genital regions, pass by way of the nervus dorsalis penis and the nervus pudendis communis to sympathetic ganglia and in conjunction with psychical stimuli act upon the vegetative nerve fibres controlling the blood vessels. The spinal connections of this reflex path lie in the second sacral segment. A part of this vegetative reflex arc is made up of many fibres and carries stimuli from the seminal vessels, the bladder and rectum. These pass through the hypogastric plexus and contribute to the vascular action. It may happen that the spinal connection of this series of fibres may be cut or diseased. This accident will not prevent erection but there will be no erotic sensations, the erection then only being seen rather than felt. Certain quack-remedy sellers and perverse panderers make use of this mechanism empirically and endeavor to bring about prolonged erection with diminished feeling, thus endeavoring to «restore lost manhood,» as they call it. These remedies and methods are extremely dangerous and bring about serious types of impotence. Certain surgical procedures such as passing cold sounds, prostatic massage, anal lavage, etc., also produce at times the most serious results, especially when carried out by ignorant quacks. Since such irregular so-called doctors are not licensed no legal redress can be obtained as a result of such malpractice.

As a result of certain diseases of the spinal cord — usually transverse lesions in the cervical or dorsal region, permanent erection — priapism — may take place. In other spinal cord injuries or diseases as in tabes dorsalis usually lying in or involving the lumbar and sacral segments loss of the power of erection may take place. Loss of this power, however, is chiefly due to psychogenic causes and can often be cured by appropriate psychotherapy. The obstinate cases are usually amenable to psychoanalysis, by which procedure the unconscious psychogenic roots of the difficulty are discovered. The mechanism of erection has its analogue in the female and the same reflex pathways are present. The clitoris tends to become erect, also the erectile tissues of the vulva. The glands of the vulva, including the large glands of Bartholini, secrete mucus and lubricate the vagina in a manner analogous to the secretion of the prostate gland in the male which serves a similar purpose.

(3) Orgasm consists in the discharge in the male of the mixed secretion called the semen into the vagina accompanied by rhythmical contractions, followed by a sense of relief of tension and satisfaction. An analogous series of contractions takes place in the female, with a mucous discharge from the vaginal glands and movements of the uterus.

In the act of ejaculation, as in all motor activities, both the sympathetic and spinal systems come into action.

The reflex functions of the former come into play in that the summation of adequate stimuli (rubbing movement) acting upon the erected organ causes peristaltic contraction of the smooth muscles of the three secretion-bearing organs, the vas deferens, seminal vesicles and prostate. This causes the orgasm and empties the mixed secretions into the prostatic urethra. A secondary reflex of a somatic nature now occurs, namely, a contraction of a spinal cord origin of the cross striated bulbo cavernosi and ischiocavernosi muscles which act forces the semen out of the prostatic urethra.

The sympathetic arc of this reflex mechanism is seldom disturbed, while on the other hand the somatic arc frequently is injured by spinal cord lesions, particularly deep-seated diseases of the conus. When this injury occurs there is also disturbance of the mobility and sensation of parts supplied by near-by muscles. The semen under these latter circumstances is not forcibly ejaculated, but flows off drop by drop.

The relaxation following ejaculation is partly due to a passive process, decrease in tone in the N. erigentes, partly to an active process, contraction of the smooth muscle of the skin of the penis and of the erectile bodies. Nocturnal flow of semen during sleep or pollution may occur without sensory stimuli acting upon the individual and may yet be accompanied by the marked and well-known feelings of passion. This may be called orgasm and is regularly accompanied by the manifestations of stimulation in the rest of the vegetative system (mydriasis, hyperidrosis and tachycardia).

An enormous variation exists among men and women with reference to orgasm. The prevailing maladjustment in men is premature ejaculation; frigidity or delayed orgasm in the female. Failure of a satisfactory sexual rapport in married life is extremely frequent and is chiefly a result of faulty sexual education, largely induced by social customs. It may be said that the human being is sex-obsessed and it is the function of a rational sexual education to relegate the genital satisfactions to their proper rôle as but one of the sources of human happiness. The prevailing prudery of ~~the Victorian period~~, while based upon rational sex-ethics, was a movement which overshot its mark and is in need of revision. A more sensible and honest handling of the entire problem, and it is a highly complicated one, must be entered into before a pragmatic sexual ethics can be evolved. The scientific application of psychoanalysis has proved of inestimable value in evolving general principles of great practical aid in this difficult field of ethics. Consult Freud, 'Three Contributions to the Theory of Sex'; White, 'Mental Hygiene'; Jelliffe, 'Technique of Psychoanalysis'; Forel, 'Sexual Problem.'

SMITH ELY JELLIFFE.

COJUTEPEQUE, kō-hoo'ta-pā-ka, Central America, town in the republic of Salvador, capital of the department of Cuscatlán, and on the direct route between the town of San Salvador and San Vincente, and about 20 miles east of the former. There is a lake of the same name at some miles distance, the fish of which are often cast ashore dead in considerable quantities. It is situated north of the volcano Cojutepeque and near Lake Isopango. The city has considerable transit trade. For a few years after 1854, when San Salvador was destroyed by an earthquake, it was the capital of the republic. Pop. 10,000.

COKE, kōk, SIR **Edward**, English jurist: b. Mileham, Norfolk, 1 Feb. 1552; d. Stoke Pogis, 3 Sept. 1634. He was educated at Trinity College, Cambridge. From the university he went to London and entered the Inner Temple. He pleaded his first cause in 1578 and the following year was appointed reader of Lyon's Inn, where his lectures were much frequented. His reputation and practice rapidly increased and he was placed in a situation of great respectability and affluence by a marriage with a co-heiress of the Paston family. He was chosen recorder of the cities of Norwich and of Coventry; was engaged in all the great causes at Westminster Hall and in 1592 chosen one of the knights of the shire for his county and speaker of the House of Commons. In 1592 he became solicitor-general and soon afterward was appointed attorney-general. He acted the usual part of a Crown lawyer in all state prosecutions; and one of the most important that fell under his management, as attorney-general, was that of Essex, which he conducted with great asperity. Soon after the accession of James I he was knighted. The celebrated trial of Sir Walter Raleigh followed, in which Coke displayed a degree of arrogance to the court and of rancor and insult toward the prisoner, which was universally condemned at the time, and is one of the greatest stains upon his character. On the discovery of the gunpowder plot he obtained great credit by the clearness and sagacity with which he stated the evidence. In 1606 he was appointed chief justice of the Common Pleas; and in 1613 became chief justice of the Court of King's Bench, but was in much less favor with James than his rival, Lord Bacon. He was, in fact, too wary and staunch a lawyer to commit himself on the subject of the prerogative; and as his temper was rough and his attachment to law truly professional, he could scarcely forbear involving himself with a court so notorious for arbitrary principles as was the English during the reign of James. The honorable zeal which he displayed in the execrable affair of Sir Thomas Overbury and in the prosecution of the king's wretched minions, Somerset and his countess, for that atrocious murder, made him enemies; and advantage was taken of a dispute in which he erroneously engaged with the Court of Chancery, to remove him, in 1616, both from the council and his post of chief justice. His real offense, however, was a refusal to favor the new favorite, Villiers, in some pecuniary matter. Coke was recalled to the council in 1617 and actively engaged in prosecutions for corruption in office and for offenses the punishment of which by exorbitant fines was designed as a means of replenishing an exhausted treasury. On the accession of Charles I he was nominated sheriff of Buckinghamshire, in order to prevent his being chosen member for the county, which, however, he represented in the Parliament which met in 1628. The remainder of his career was distinguished by his defense of the law against the attacks of the royal prerogative; he greatly distinguished himself by his speeches for redress of grievances; vindicated the right of the Commons to proceed against any individual, however exalted; openly named Buckingham as the cause of the misfortunes of the kingdom; and, finally sealed his services to the cause by proposing and framing the famous "Petition of

Rights,» the most explicit declaration of English liberty which had up till that time appeared. This was the last of his public acts. His principal works are 'Reports,' from 1600 to 1615; 'A Book of Entries' (1614); 'Institutes of the Laws of England,' in four parts; the first of which contains the commentary on Littleton's 'Tenures'; the second, a commentary on Magna Charta and other statutes; the third, the criminal laws or pleas of the Crown; the fourth, an account of the jurisdiction of all the courts in the kingdom; 'A Treatise of Bail and Mainprise' (1636).

COKE, Thomas, first bishop of the Methodist Episcopal Church in the United States: b. Brecon, South Wales, 9 Sept. 1747; d. at sea, 2 May 1814. He was educated at Oxford and entering the ministry of the Established Church obtained a curacy at South Petherton. Sympathizing strongly with the Methodists, he sought an interview with Wesley, which resulted in his joining that society and being appointed to London. He rendered valuable assistance to Wesley in procuring what was called the deed of declaration, which provided for the settlement of the Methodist chapels in the connection and restricted the conference to 100 of the preachers and their successors forever. He was appointed president of the Irish conference in 1782. Wesley set apart Coke by ordination as superintendent of the Methodist Church in America and gave him authority to ordain Francis Asbury as joint superintendent. In 1784 he arrived in New York and exceeded his instructions by ordaining Asbury a bishop. As such they were duly accredited, to Wesley's annoyance, as the joint bishops of the Church in America. In company with Asbury he traveled, visiting the different conferences, until June 1785, when he returned to England and visited Wales, Scotland and Ireland. Subsequently he returned to America. The first mission which he established was in the West Indies, in 1786, whence, after visiting the several islands, he went to South Carolina and engaged again in the regular work of the episcopacy. After traveling through the States, he embarked from Philadelphia for England in 1787. He revisited the West Indian and other American missions again and again, crossing the Atlantic 18 times in all. He was a prolific author and published 'Commentary on the Holy Scripture' (1803–07); 'Life of Wesley' (1792); 'History of the West Indies' (1808); etc.

COKE. Introduction.— One of the most important fuels of to-day is coke. It has influenced to a greater extent than any other one fuel the immense advances made in the iron and steel industry of the present time. The immense production of pig iron is due in a great measure to its peculiar adaptability to the special requirements of the blast furnace. Its manufacture has influenced many millions of dollars invested in the development of its by-products, and from these by-products have been developed, especially in Continental Europe, many important industries. Modern war as fought with high explosives would be impossible without the by-products of the coke ovens. Tar is the raw material in the aniline dye and briquette industry, as well as others of great importance; from the gas, light, fuel and oils are obtained, and from the ammonia sulphate, the anhydrous ammonia and aqua ammonia utilized to such a large extent in refrigerator plants. The present is an «era of coke,» as well as of iron, steel and electricity, for without this invaluable fuel the others would hardly have been possible.

Definition.— Coke is the solid residue remaining from the dry distillation of bituminous coal. It consists chiefly of carbon with the mineral matter or ash of the original coal and such small proportion of the volatile components of the coal as the degree of heat employed has failed to dislodge. There are two types of coke — furnace coke and gas coke. The former is produced at a high temperature gained as rapidly as possible in order to form a hard crust on the outside of the coke fragments to retain as much as possible the carbon vapors from the interior. The coal selected for this operation has a low content of volatile resinic matters, and the retort in which it is made is packed closely with the coal, so as to leave little empty space. In the manufacture of gas coke the valued product is the gas, and the coal chosen has a high content of volatile resins and the retort is loosely and only partially filled. Gas coke averages: Carbon, 84.4 per cent; hydrogen, 0.2 per cent; nitrogen and oxygen, 6.3 per cent; sulphur, 0.8 per cent; and ash, 8.3 per cent. Furnace coke averages: Carbon, 86 to 92 per cent; ash, 6 to 9 per cent; volatile matter, 0.3 to 1.3 per cent; moisture, 0.2 to 0.7 per cent. Coke differs in porosity and specific gravity to some extent according to the type of retort in which it is made. Coke from a vertical retort will show 40 per cent pores and a specific gravity of 1.08; that from a horizontal retort a porosity of 46 per cent and a specific gravity of 0.91. The heating value of coke is about 14,400 B.T.U. The basic analysis on which most coke is now bought and sold is as follows: Fixed carbon, 85.5 per cent; ash, 12 per cent; volatile matter, 1.0 per cent; sulphur, 1.1 per cent. Moisture is deducted, the payment being on the dry coke. By volume the coke is estimated at 50 per cent porosity and the standard specific gravity is 1.89 for the solid coke substance.

Discovery and History.— Coke is reported to have been an article of commerce in the Chinese province of Hunan some 2,000 years ago. The process seems to have been adapted from the charcoal industry that flourished extensively in the Middle Ages. Coke was made in Germany in 1584, at the Hohenbuechen mines in the Harz, by Duke Julius von Braunschweig-Lüneberg, and about the same time the master of the Anhalt mint, Daniel Stumpfelt, made a similar discovery. It appears that in both instances the coke was designed for use as a smokeless fuel, rather than for iron smelting, a use that developed later on. In England a patent for the «de-sulphurizing» of bituminous coal was granted to the dean of York in 1590, and in 1619 Dud Dudley, an ironmaster of Worcestershire, was successful in making coke. Up to this time the coke appears to have been made in the same way as charcoal, namely, by burning in a mound or «meiler,» the coal lumps being so piled as to leave draught openings and the whole covered with coal dust or earth. This primitive method gave place to a pit dug in the ground, or to a walled enclosure, into which the coal was piled, and later into a covered structure known as the «bee-hive oven,» so-called from its shape. Such an oven was patented by Sir William St. John and others in England in the year 1620, particular mention being made of the use of the coke so made in manufacturing iron or steel. The bee-hive oven did not come into extended use in England until about 1735, when Abraham Darby operated a blast furnace at Colebrookdale, Shropshire, with coke, an example soon followed by others. This innovation was hastened by the increasing scarcity of wood for charcoal, which was the fuel first used for iron smelting. In France, Gabriel Jars, who had visited the English iron-works, is reported to have introduced the use of coke at the iron-works in Sainbel. In Germany, Prince Wilhelm Heinrich made coke in closed muffle-ovens of peculiar design, at Sulzbach near Saarbruecken, in 1767, and with it made, it is stated, the first coke-smelted iron on the Continent, at the Fischbacher furnace, near Sulzbach.

Beehive ovens of the English type were built in rows or batteries, both for convenience in operation and to save the heat radiated from one to another, instead of to the atmosphere. Later, modifications were made in the design of the oven, to improve its thermal efficiency and to cheapen the operation. These gave rise to the elongated shape instead of the round or square section, and the retort type of oven was thus gradually developed. The Belgian oven is typical of this form. In it the coking chamber was from 20 to 30 feet or more in length, 5 or 6 feet high and 18 to 30 inches wide, closed by movable doors at either end, and the coke was removed by a pushing ram which forced out the coked mass as in the present form of by-product oven. This oven was heated by the gas from the coal, which burned in vertical or horizontal flues built into the walls separating adjacent ovens, air being supplied by ducts from the top, and draught from a stack located at one end of a battery of such ovens, connected with them all by an underground flue. Ovens of this general type were constructed by Rexroth, Coppée and Smet about 1857-60. In 1856, however, Knab was experimenting with a closed retort oven, externally heated, from which he obtained both coke and by-products at Commentry, France. A modification of this oven was built by Carvès, and later, by Huessener, who built a plant at Gelsenkirchen, Westphalia, in 1881. At the same time, an experimental plant of 10 ovens was built at Wattenscheid, Germany, by Otto, the two last mentioned being of the true by-product type. Thus, while the origin of the by-product oven may be conceded to the French experiments of Knab, the development was due to Germany. The Wattenscheid experiments gave rise to the type of oven known as the Otto-Hoffmann, since widely extended, particularly in Germany. The modification of the Knab-Carvès oven by Simon, known as the Simon-Carvès oven was of the by-product type and was further developed by Semet, a Belgian, who in 1881 took out a patent for the oven known as the Semet-Solvay.

In the United States the beginning of the development of the coke industry dates about 1810-13. For the same reason that England was forced into its manufacture so was America. The Pennsylvania Society for the Promotion of Internal Improvements about this time sent an expert to England to study developments in the mother country in the person of W. Strickland. This occurred about 1825.

Mixtures of charcoal and coke were tried, and in 1835 in Pennsylvania a premium of a gold medal was offered to the person who would manufacture in the United States the greatest quantity of iron from the ore during the year, using no other fuel than bituminous coal or coke, the quantity to be not less than 20 tons. Results were not satisfactory, probably due to the poor quality of the coke, possibly through selecting a poor coking coal or in the method of blast furnace practice.

The first coke ovens in the Connellsville region were built in 1841, but not until 1856 was its use augmented to any great extent; at this time there were established in Pennsylvania alone 21 furnaces in blast on coke. A gradual increase in its successful use was made during the period from the use of Connellsville coke up to the year 1880. At this point the growth was extremely rapid, and its effect of increasing the iron output of the world of vital importance.

Methods of Manufacture.— Coal was first coked in heaps or mounds in the open air, following the methods of the charcoal burners, and although resulting in a first-class quality of coke was extremely wasteful. It consisted in arranging rectangular heaps or mounds with longitudinal, transverse and vertical flues to obtain a draft, sufficient wood having been distributed in the mass to produce general ignition. The mound was ignited and the fire allowed to spread to the whole mass. After the gaseous matters had been expelled, the mound was partially smothered by fine coal dust, the final operation consisting of the application of a small quantity of water, which permeated the whole mass. The application of the water tended to develop a coke with few cells and under proper management a low moisture. The yield of coke was in the neighborhood of 55 to 60 per cent, the loss being 40 to 45 per cent of the coal.

The second advance in manufacture was that of enclosing the mound in a furnace, thus utilizing to some extent the heat passing off from the coal. This form of manufacture was termed the «Bee Hive Oven,» and finally resulting in having a series of ovens, utilizing the heat on three sides of the oven and the heat of the escaping gases, to assist in coking. There was also a development in this form of oven which endeavored to throw down the solid constituents of the escaping gas in the form of tar, but the methods were, comparatively speaking, very crude, and resulted in saving but little of the 40 per cent unaccounted for.

About 1881-82 two forms of ovens appeared, which, since that date, have been developed to such an extent that but 10 to 15 per cent of the calorific efficiency of the coal is lost. In America to-day there are two standard types of ovens, the beehive and the by-product, both of which are described in a following paragraph.

Chemical and Physical Qualities.— These two qualities of the coke do not seem to hold much if any relation to each other — that is, the coke may have a fairly good analysis chemically and yet, if its physical qualities are below the standard, it would be useless for the metallurgist.

Several theories have been brought forward to explain the coking of coal, and that held by M. Lemoine is presented but the question is still undecided. Lemoine comes to the conclusion that there is a substance, which he calls "Carbene," which determines the coking quality of coals. This substance he claims resembles a "fat coal." It is black, solid, friable, with a tendency toward crystallization, and is of the formula $C_{22}H_{14}O_6$.

Carbene, he says, has the property of adhering to solid bodies and spreading itself over their surface to an extent which is unknown in any other body. When a large amount of coal is subjected to distillation, as in a coke oven, the carbene may be driven from one part of the heated coal to settle itself upon the cooler portion of the mass, and thus to increase the agglutination of this part. This process may continue throughout the entire thickness of the mass until the coke is formed.

M. Lemoine claims that laboratory experiments have shown the possibility of transforming a non-coking coal into a good coking coal by means of the addition of 2 per cent of carbene. In one coal tested, which had 10 per cent volatile, the yield was 93 per cent. In conclusion, he claims we may therefore hope to produce good coke from coals which have hitherto been considered non-coking coals, and further experiments in this direction are being carried on.

The physical characteristics of a coke are of far greater economic importance than its chemical character. Hardness is exceedingly important, and porosity is an essential. Certain coals in the coking operation, in giving off their volatile ingredients, produce in the viscous mass a greater amount of cellular structure than others. According to Fulton, good coke has a hardness of body of 2 to 3 in the usual physics scale. Condensed coke does not mean great hardness, but, on the other hand, means softness.

An important point which goes to prove the extreme adaptability of coke in blast furnace and lime kiln practice is the fact that, due to its cellular condition or porosity, the heat can the more readily prepare it for combustion, and consequently after it has in its descent in the furnace reached the zone of combustion it is in the most perfect state possible for such action, and yet, due to its hardness, it has held its form and sustained the immense mass above it without being crushed, thereby allowing the highest per cent efficiency for blast.

Another consideration is that in equal calorific quantities of anthracite coal and coke the volume of space occupied by coke is much greater than that of coal; hence, it can distribute its heat to a greater mass of burden than the coal and avoid concentration of an excessive heat at one point as when using anthracite coal.

Economical and Commercial Consideration of Coke Manufacture.— These features of the industry should not be considered independently. As stated previously, the waste from the beehive method of producing coke to-day is enormous; not alone is part of the coal consumed in the coking operation, but all the gases and volatile matters escaping from the furnace contain material of great value.

The by-product oven of to-day requires in its management a large amount of chemical and metallurgical skill.

The distillate from tar has many new uses besides the well-known one of creosoting railroad ties. The expansion of the American dyestuff industry, due to the failure of the European supply, and the immense increase in munition manufacture has made a new market for tar distillates.

Another branch of the by-product industry is the recovery of oils of the aromatic series from the gases. Of the 10,000 cubic feet of gas produced from a ton of coal, 6,500 cubic feet are required in the coking process. This gas contains on an average 0.75 per cent of benzene (benzol) and its homologues. The heat value of this gas is affected only slightly by the removal of the benzene. By washing gas with petroleum or coal tar oil, a benzolized oil containing 2 to 3 per cent of benzene is produced, and by distillation of crude benzene light oil is obtained.

Only slight quantities of impurities, carbon disulphide, hydrogen sulphide, thiophene and napthalene are found to be present, and purification and redistillation furnish a benzene 100 per cent pure, and suitable for nitrifying and converting into aniline.

From the oil which is with the pitch (the result of the distillation of crude coal tar) is obtained anthracene, another important base of dyestuffs. From creosote oil are obtained napthalene, carbolic acid and other homologues. Carbolic acid is the base of picric acid, which is the main ingredient of the latest high explosives, as English Lyddite, French Melinite, the Japanese Shimose powder and our own Maximite.

The by-product ovens are the leading producers of ammonia in the country, and this crude product forms the raw material for refined ammonia products, and also furnishes a supply for the manufacture of soda by the ammonia process. Ammonia is also being used for the manufacture of explosives and for the production of the refined aqua ammonia which is largely consumed in refrigerator machines, either as aqua ammonia or anhydrous ammonia. As sulphate, ammonia is largely consumed in the manufacture of fertilizer. The consumption of fertilizer is increasing in this country, especially in the South, and sulphate of ammonia is regarded as a most valuable form of plant food. Commercially speaking, therefore, the by-product oven cannot have a healthier growth than is justified by the demand of the industries that consume its by-products.

The Beehive Oven.— The type of this oven is as shown in illustration. It is 12 to 13 feet in diameter, with a 7 to 8 feet height of dome above floor level, lined with siliceous brick backed with concrete or masonry. The charging hole is on top, and the oven door slightly higher than the level of the charge.

Various systems have been established to utilize the waste gases and heat of the coking operation, either by surrounding the furnace with ducts, or utilizing the heat in an adjoining plant. All these steps in the progress of development tend toward the by-product oven, but more particularly is it true when it is the aim to save the by-products.

At the close of 1905 practically 89 per cent of the coke in the United States was manufactured in beehive ovens, due to the non-available market for the by-products. In 1915 the beehive ovens made only 66 per cent of the whole. The cost of erecting a beehive oven is very small in comparison with that of a by-product oven, hence the commercial policy of replacing the beehive oven with a by-product oven only as fast as the market conditions demand the by-products.

The By-product Coke Oven.— The by-product coke ovens are of two types: the waste heat oven adopted where the gas produced is not in demand by local industries and the regenerative oven built in localities where the surplus gas can be sold. Coals not available in the beehive ovens can be coked in the by-product ovens and specific grades of coke can be produced by skilful mixing of different kinds of coal. The yield of coke in a by-product oven is commonly 75.3 per cent of the coal consumed as against 64.7 per cent in the beehive oven. If the larger yield had been obtained for the coal coked in the beehive ovens also, the country would have been the richer by 4,253,218 tons of coal, wholly wasted in the beehive process, to say nothing of the value of the by-products recovered. The coal consumed in the by-product ovens is a mixture of high volatile or gas coal — from Kentucky, the Kanawha or Fairmont districts of West Virginia or from southwestern Pennsylvania — with the low volatile or smokeless coal from the Pocahontas and New River fields of West Virginia, or from central Pennsylvania. It is not uncommon to find West Virginia coal at the coke ovens of Wisconsin and Minnesota. A representative plant of 100 ovens has been selected for description as applying the principles underlying by-product oven practice to-day in the United States.

The ovens are arranged in two groups or batteries of 50 ovens each. Each oven is an air tight retort, consisting of a rectangular chamber 43 feet 6 inches long, 17 inches wide and 6 feet 6 inches high. The ovens are placed side by side and are supported on a steel structure, consisting of light I-beams, running the length of the battery, which rest on cross girders supported by steel columns. The construction allows the brick work to be inspected at all points. The primary object, however, is the uniform distribution of fuel gas to the combustion chambers for heating the oven retorts. The retorts are separated by hollow walls, which are divided into 10 compartments, each compartment containing four, preferably vertical, flues. Alongside this chamber, and directly under the vertical flues, are 10 combustion chambers. The gas supply to each of the chambers is controlled independently, and a uniform heat is maintained throughout the entire length of the oven. The air for combustion is admitted through an opening in the wall between the air and combustion chambers. The air is heated to 1800°. F. by a pair of regenerators, placed together under the centre of the battery and running its entire length. A vertical flue conducts the air from the regenerator to the air-chamber under the oven.

The well-known Siemens principle is used in operating the air generators, with reversals every 30 minutes. The fuel gas is reversed at the same time as the air by means of a suitable valve; but the gas is not regenerated. The gas unites with the hot air in five combustion chambers, ascends through the vertical flues to a horizontal flue above, through which it passes and descends through the five chambers in the other end of the oven, thence through the air chamber and vertical flue connection to the regenerator, and through the reversing valves to the stack. The regenerators are built entirely independent of the oven structure, so that their expansion does not affect the oven brickwork.

Coal Handling.— A steel coal storage bin of a capacily equivalent to about two days' coal consumption is placed between the batteries. The coal is elevated to the bin from a hopper placed under the coal receiving track, by a belt or other type of conveyor. A coal larry of eight tons' capacity runs on a track on the top of the batteries and under the coal bin. The larry consists of a long narrow bin with eight spouts in the bottom through which the coal is run into the oven retort through holes in the top of it and is leveled by means of a bar worked through a small opening in the doors at the ends of the oven. The larry is operated by an electric motor and receives its load of coal from the storage bin, under which it passes. A very dense metallurgical coke can be produced, and the output of an oven largely increased by compressing the coal into a mold slightly smaller than the retort and charging the mass through the oven door.

Coke Handling.— Upon the completion of the coking process, the oven doors are raised and the mass of six tons of coke is pushed upon a movable platform by means of a ram. The pushing ram, as well as the machine on which it is mounted, are operated by electric motors. The coke after being pushed upon the platform is quenched with a spray of water and allowed to cool. The platform is then tilted by an electric motor, and the coke slides off into cars, which run on a track at the back of the machine. At some ovens the coke is discharged into cars and there quenched, or the cars are run off to a quenching station.

Gas Mains.— The gas distilled from the coal during the coking process is conducted to the condensing house by two independent systems of mains. These mains run on top of the battery the entire length — one on each side. Each oven is connected to each main by a vertical pipe and valve. During the first part of the process, the rich gas is taken off through the rich gas main. The valve to this main is then closed and the balance of the gas is taken off through the poor gas main. When the coking is completed, the valve to the poor gas main is closed, disconnecting the oven from both mains.

Condensing Plant.— The gas leaving the coke ovens is divided into two fractions, viz., the first fraction of «rich» gas, which is sent out as illuminating gas, and the second fraction or «poor» gas, which is used for heating the ovens. The cooling of the gas and the removal of the tar and ammonia are done in the usual apparatus, hence it is not necessary to discuss it here in detail. Both the rich and poor gases are treated in the same manner.

The rich gas when freed of tar and ammonia leaves the condensing plant and passes into the purifying plant, and from there into a large gas holder for illuminating gas, from which it goes into the city. The poor gas, after being treated in the same manner as the rich gas, leaves the ammonia washers and passes through two benzol scrubbers. Here it is mixed with producer gas, when necessary, and carried to the ovens for heating.

The tar oil by which the gas is washed runs first from a tank through the second benzol scrubber into another tank. From here it is supplied by a pump into the first benzol scrubber. The tar-oil enters the tank with about 5 per cent of benzol, and finally leaves the washer with about 15 per cent of benzol. It is collected in another tank. From here it is fed by a pump into a still, in which the benzol is reduced again to about 5 per cent. The exhausted oil collects in another tank. From here it is taken by a pump through the oil cooler in order to be again supplied to a tank for a new absorption of benzol.

A small additional plant is needed, by which a small percentage of the oil is revivified, in order to keep it active for benzol absorption. This consists of a simple tar still and condenser, in which the tar-oil is freed from most of the napthaline and other hydrocarbons incidentally absorbed. The presence of an excessive percentage of them in the tar-oil would interfere with a complete benzol absorption. It is unnecessary to describe here the details of the benzol distilling plant. A great number of these are in operation in connection with German by-product plants.

Coke Oven Brick.— Under construction the principal feature of an oven is in the brick used. What is termed silica brick is now being used, and probably will be the standard coke oven brick of the future. It has been determined that the fusing point of a silica-alumina brick reaches the lowest temperature at 60 per cent silica and 40 per cent alumina, but if the silica is increased up to say 90 per cent, an infusible brick of the highest quality is the result.

For all classes of work, a good high grade plastic No. 2 fire clay, with possibly a small amount of flint clay, should be used. This will make a creamy, sticky slip, which will make an excellent joint. The joints are always weak spots, and are therefore a necessary evil. The brick should always be dipped into the mortar, which should be of the consistency of cream, and rubbed on each other to make a good tight contact.

Coking Coals.— There are three principal coal area sections in the United States supplying good coking coal. The Connellsville section in Pennsylvania was the first developed, and it is reported that this supply is fast disappearing. The second section is that of the Pocahontas field in West Virginia, and the third is in Colorado. As the good coking coal fields disappear, so will the by-product ovens come into use, for it is possible to coke a coal in a by-product oven that it is practically impossible to coke in the beehive type.

Production.— In 1915, according to the report of the United States Geological Survey, there were in the United States in active operation 48,985 coke ovens of the beehive type and 5,982 by-product ovens. There were also 44,125 beehive ovens and 286 by-product ovens idle; and 557 beehive and 1,191 by-product ovens building. During the year 1,563 ovens were abandoned. The quantity of coke produced in that year was 41,581,150 tons, valued at $105,503,868, about the usual average production, but an increase of about 20 per cent over the low production of 1914. The beehive ovens consumed 42,278,516 tons of coal, producing 27,508,225 tons of coke, valued at $56,945,543, an average value of $2.07 per ton. The by-product ovens consumed 19,554,382 tons of coal, producing 14,072,895 tons of coke, valued at $48,558,325, an average value of $3.45 per ton.

Among the coke-making States Pennsylvania ranked first, producing 22,530,567 tons of beehive coke, and 4,301,726 tons of by-product coke. Virginia ranked second in the production of beehive coke, with 1,250,235 tons, followed by Alabama with 1,001,479 tons. Indiana was second in by-product coke, with 2,768,099 tons and followed by Alabama with 2,070,334 tons and Illinois with 1,686,998 tons.

About two-thirds of the entire output of coke in the United States is made in Pennsylvania, and 72 per cent of the Pennsylvania output is made in the Connellsville district, with its upper and lower extensions. In Connellsville in 1915 there were 21,343 ovens active; in Lower Connellsville, 16,037 ovens; and in Upper Connellsville, 2,552 ovens; and 605 more were under construction.

The value of the by-products of the coke industry in 1915 was $29,824,579, an increase of more than $12,000,000 over the previous high record mark of 1914. The greater part of this increase was in benzol and benzol products, which in 1914 were valued at $997,007, and in 1915 at over $7,000,000. Previous to 1914 the demand for these products had been small and the prices low, the market being supplied almost wholly by the coke ovens of Germany. But the shutting off of this source by the war created an imperative demand at almost any price for the raw material for dyestuffs and high explosives, the products of the distillation of coal, and the by-product coke ovens became of unwonted importance. Among the more valuable by-products of the coke industry in 1915 may be mentioned the following: Gas, illuminating and fuel, 213,667,614,000 cubic feet, valued at $8,624,899; ammonia, anhydrous and liquor, a value of $9,867,475; tar, 138,414,601 gallons, valued at $3,568,384; benzol, 2,516,483 gallons, valued at $1,428,323; toluol, 623,506 gallons, valued at $1,529,803; crude light oils, 13,082,678 gallons, valued at $4,304,281. The yield of coke in the different plants ranged from 1,340 to 1,550 pounds per ton of coal consumed, and the tar production ranged from 5.5 to 13 gallons per ton. The recovery of ammonia reckoned as anhydrous was from 4.33 to 6 pounds per ton, equivalent to from 13.5 to 25 pounds of ammonia sulphate.

Consumption.—The consumption of coke in the United States in 1915 amounted to 40,394,445 tons, of which 53,222 tons were imported, and the remainder of domestic origin. About 36,700,000 tons (91 per cent) were used in blast furnaces; 1,665,000 tons (4 per cent) in foundries; and 1,974,000 tons (5 per cent) for domestic purposes. The exports of coke for 1915 amounted to 895,509 tons, of which about 74 per cent went to Canada and 18 per cent to Mexico.

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COKE OVEN GAS ENGINE. See Internal Combustion Engine.

COLA, a genus of trees of the family *Sterculiaceæ*, consisting of about 40 species, natives of tropical Africa. One species is extensively grown in the tropics for the cola-nuts, which are said to sustain the African natives in feats of endurance. They are imported into the United States for use in medical preparations and in summer drinks.

COLA-NUT, the seed of a tree (*Cola acuminata*) from 20 to 30 feet in height, belonging to the natural order (*Sterculiaceæ*), whose habitat is a region of West Africa stretching 500 miles from the coast into the interior, between Sierra Leone and Lower Guinea. The tree has become naturalized in the West Indies and Brazil. It bears a profusion of purplish flowers. The flower yields a large brownish-yellow fruit, which enfolds in the same follicle the red and white seeds called cola-nuts. In its tenth year the tree reaches its greatest fecundity, and then yields 120 pounds of seeds. They are gathered in October and November from a June flowering, and again in May and June from a December flowering. In the tropics the natives use the cola-nut as a stimulant and for medicinal purposes, and only recently has the nut passed from the narrow use of the aborigines into an extensive service of civilized man. An analysis of it shows that it contains nearly all the constituents of coffee, tea and cocoa, and other constituents not possessed by them.

COLBERG, or **KOLBERG,** Prussia, seaport and watering-place in the province of Pomerania, on the Persante, near its mouth, 170 miles north-northeast of Berlin. It stands on a hill, surrounded with three suburbs. The principal church dates from 1316. Colberg had its origin in an old Slav fortress. It received municipal rights in 1255 and joined the Hanseatic league in 1284. The town hall was built by Zwirner, the architect of the Cologne Cathedral. It has a gymnasium, a school of navigation, and new government buildings. In 1102 Duke Boleslaus of Poland vainly besieged Colberg, which endured long sieges in the Thirty Years' War, in the Seven Years' War, and again in 1807, when it was most gallantly defended against the French. Colberg has a well-protected harbor at its suburb of Münde, which is a favorite sea-bathing resort. Its industries include iron foundries, machine works, and it also makes pharmaceutical preparations, lumber and tobacco. Its former strong fortifications have been demolished.

COLBERT, kōl'bār, **Jean Baptiste,** French statesman and financier: b. Rheims, 29 Aug. 1619; d. Paris, 6 Sept. 1683. He entered in 1648 the service of Cardinal Mazarin, who availed himself of his assistance in the financial administration of the kingdom. Mazarin rewarded him in 1654 with the office of secretary to the queen, and recommended him to the king at his death in 1660. Louis XIV made Colbert comptroller-general of finances. His task was to remedy the evils which the feeble and stormy reign of Louis XIII, the splendid but arbitrary measures of Richelieu, the troubles of the Fronde and the confused state of the finances under Mazarin had occasioned. He found fraud, disorder and corruption prevailing everywhere. Burdens, privileges and exemptions were multiplied without measure; the state was the prey of the farmers-general of the state revenues and at the same time maintained only by their aid. The revenues were anticipated for two years, and the treasury empty. He began with establishing a council of finances and a chamber of justice. For the purpose of alleviating the public burdens he endeavored to lower the interest of the public debt; and in order to mitigate the odium of this measure consented to a considerable diminution of the taxes, and the remission of all arrears up to 1656. He abolished many useless offices, retracted burdensome privileges, diminished salaries, and by a better distribution and collection of the taxes was able to reduce them almost one-half. Notwithstanding the expenses of nearly 10 years' war, and the prodigality of a luxurious king, Colbert succeeded in 22 years in adding to the revenues more than 28,000,000 livres, and making an equal diminution in the public burdens. At his death in 1683 the revenue actually received amounted to 116,000,000 livres. To his talents, activity and broad views the development and rapid progress of industry and commerce in France were largely due. He constructed the Canal of Languedoc; formed the plan of that of Burgundy; granted premiums on goods exported and imported; regulated tolls; established insurance offices and made uniform laws for the regulation of commerce. He was appointed Minister of Marine in 1669. Under his administration naval schools were established, and order was introduced into all branches of the marine. He was the creator of the French navy, to which he added, in three years, a fleet of over 100 vessels, among which were 60 ships of the line and 40 frigates. By the advice of Colbert Louis XIV caused the civil and criminal legislation to be improved, and the arts and sciences encouraged. Under the protection and in the house of the Minister (1663) the Academy of Inscriptions was founded. Three years afterward he founded the Academy of Sciences, and in 1671 the Academy of Architecture. The Academy of Painting received a new organization. He enlarged the Royal Library and the Garden of Plants, and built an observatory in which he employed Huyghens and Cassini. He began the measurements of the meridian in France, and sent men of science to Cayenne. After having conferred the greatest benefits on his country he died, out of favor with the king, and dreading the exhaustion of the treasury by the new war Louis was resolved upon making against Holland. Consult Gourdautt, 'Colbert, Ministre de Louis XIV.'

COLBORNE, Sir **John,** English soldier and administrator: b. 1778; d. 1863. He was educated at Christ's Hospital and Winchester

College, entered the army in 1794, was present at the battle of Corunna and saw service under Wellington in the Peninsula and at Waterloo. From 1828–35 he was lieutenant-governor of Upper Canada, and founded Upper Canada College. His endowment of the Crown rectories was regarded by Durham as a predisposing cause of the Rebellion of 1837. He was created Lord Seaton in 1839, and was subsequently governor of the Ionian Islands, and commander-in-chief in Ireland.

COLBURN, kōl'bėrn, **Warren,** American mathematician: b. Dedham, Mass., 1 March 1793; d. Lowell, Mass., 13 Sept. 1833. He at first worked at a machinist's trade, but developed a taste for mathematics, and was graduated at Harvard (1820). He devised important improvements in machinery, and for many years was a popular lecturer on the sciences. He is best known for his 'First Lessons in Intellectual Arithmetic' (Boston 1821) which he had planned while a student at Harvard. He also published a 'Sequel' to the arithmetic (rev. ed., 1833), and an 'Algebra' (1827).

COLBURN, Zerah, American engineer: b. Saratoga, N. Y., 1832; d. Massachusetts, 4 May 1870. In 1854, he started in New York, the *Railroad Advocate.* He visited Europe in 1857, and in 1858 began writing for the London *Engineer,* of which he shortly became editor. He began the publication of *Engineering* in London 1866 but in 1870 he returned to the United States, where he finally committed suicide. He wrote 'The Locomotive Engine' (1851), and a number of valuable technical papers.

COLBY, Albert Ladd, American metallurgist: b. New York, 26 June 1860. He was educated at the College of the City of New York and at the Columbia School of Mines. He has been engaged in steel metallurgy since 1886, was secretary of the Association of American Steel Manufacturers 1897–1905. He was iron and steel commissioner at the Saint Louis Exposition of 1904. He has published 'American Standard Specifications for Steel' (1902); 'Reinforced Concrete in Europe' (1909), also several technical papers.

COLBY, Charles Carroll, Canadian statesman: b. Derby, Vt., 1827; d. 1907. He was graduated at Dartmouth College in 1847, was admitted to the Quebec bar in 1855 and practised for several years at Stanstead. Later he abandoned law and engaged in industrial and mining pursuits. In 1867 he was elected to the House of Commons from Stanstead and continued to represent that constituency until 1891. In 1889–91 he was president of the Privy Council under the premiership of Sir John A. Macdonald. He was an able debater and a consistent advocate of the protective policy adopted in 1878. He published 'Parliamentary Government in Canada' (1886).

COLBY, Charles William, Canadian educationist and author: b. Stanstead, Quebec province, 25 March 1867. He was educated at Stanstead College, McGill University (graduated 1887) and Harvard University. He was lecturer in English language and history at McGill University 1893–95, and was Kingsford professor of history 1895–1910. He is the author of 'Sources of History' (1899); 'Canadian Types of the Old Régime' (1908); 'The Fighting Governor' (1916), etc.

COLBY, Everett, American public official: b. Milwaukee, Wis., 1874. He was graduated at Brown University in 1897 and was admitted to the New York bar in 1899. In 1903–05 he was a member of the New Jersey House of Assembly and in 1906–09 was a member of the Senate, despite the opposition of the «machine» politicians of his party. In 1913 the Progressive party chose him as its candidate for governor of New Jersey.

COLBY, Frank Moore, American writer: b. Washington, D. C., 10 Feb. 1865. He was graduated at Columbia University 1888, and took graduate studies in political science there. He taught history at Amherst College 1890–91; was lecturer in history at Columbia 1891–95; professor of economics in New York University 1895–1900, when he became an editorial writer on the *Commercial Advertiser.* He has done a large amount of editorial work on Johnson's 'Cyclopædia'; the 'International Cyclopædia,' and 'International Year Book,' editing the latter from its foundation in 1898, until 1902, and editor of the 'New International Year Book' since 1907, and was one of the editors of the first edition of the 'New International Encyclopædia' (1902–03); and of the second edition (1913–15). His other literary work comprises editorial writing for the New York *Commercial Advertiser;* the «Book of the Month» in the *North American Review* 1913–, as well as critical articles for the *Bookman* and other magazines, and 'Outlines of General History' (1900); 'Imaginary Obligations' (1904); and 'Constrained Attitudes' (1910). He is best known, perhaps, as the author of the two works last mentioned.

COLBY, Harrison Gray Otis, American naval officer: b. New Bedford, Mass., 28 Jan. 1846. He was graduated at the United States Naval Academy in 1867. He was promoted through various grades to captain in 1902; served on the *Dakotah* during the Civil War and was commander of the *Hannibal* and the second district coast defense, also selecting proper vessels for the government to purchase during the Spanish-American War. He was retired with the rank of rear-admiral, 28 Jan. 1908. He was executive officer of the yacht *America* in the race for the Queen's Cup with the *Cambria* and other yachts.

COLBY, Thomas Frederick, English engineer: b. 1784; d. 1852. He is the inventor of the «compensation bar» used in base measurements. For over 45 years he was connected with the British Ordnance Survey. In 1824 he planned and for 22 years thereafter supervised the survey of Ireland. Consult Portlock, 'Memoirs of the Life of General Colby' (London 1869).

COLBY COLLEGE, coeducational institution in Waterville, Me.; founded in 1818, under the auspices of the Baptist Church. It was chartered by the legislature of Massachusetts in 1813 and was known as «The Maine Literary and Theological Institution» until 1820, when its name was changed to Waterville College. In 1867 the name was changed to Colby University, in honor of Gardiner Colby, whose gifts to the college amounted to $200,000. The name was changed to Colby College in 1899. The principal college buildings include Memorial Hall, Champlin Hall, Foss Hall, North College and South College. It offers courses leading to the B.A. degree, without requiring Greek for entrance, and courses leading to the B.S. degree. Men and women are admitted on equal terms and pursue the same studies. After the first year's work, the courses are nearly all elective. The average number of students, each year, is 425. In the library are 50,000 bound volumes and about 21,000 pamphlets. The college is endowed about $600,000, and the property is valued at $500,000.

COLCHAGUA, kōl-chä'gwä, Chile, a province bounded on the north by the provinces of Santiago and O'Higgins, south by the province of Curicó, on the east by Argentina and west by the Pacific. It has an area of 3,851 square miles. The Andes traverse its eastern part while the coast range crosses its eastern half. The section between the two ranges is of great fertility, is well watered and well cultivated. Cattle raising is the principal industry. Corn, wheat, oats and beans are raised also in great quantities. The region is served by the Santiago-Valdivia Railway. The population in 1914 was 159,930, or 41.53 to the square mile. The capital is San Fernando.

COLCHESTER, kōl'chĕs-tėr, England, parliamentary and municipal borough and river port of Essex, on the Colne, 52 miles northeast of London by rail. It is partially encircled by a wall built during the Roman period, and among relics of the past it contains a castle whose enormously thick walls date from the time of William Rufus, a picturesque, ivy-grown ruin of Saint Botolph's priory, while in the church of the Holy Trinity is a Saxon doorway. The most important modern structure is the spacious and handsome town hall, completed in 1902. Colchester was known to the early Britons and the Romans as Camulodunum, and to the Saxons as Colneceaster. It has a large oyster-fishing trade, exports of corn and malt, iron manufactures, and boot and shoe factories. It is the headquarters of a military district, with cavalry and artillery barracks. In 1648 Colchester stood a memorable siege of 11 weeks against the Parliamentary forces, who eventually starved out the Royalist garrison and hung the leaders. The borough returns a member to the House of Commons. Pop. 43,452. Consult Cutts, 'Colchester' in 'Historic Town Series' (1889).

COLCHESTER, Vt., town in Chittenden County, comprising the village of Winooski, two miles from Burlington, on the Central Vermont Railroad. It contains a public library and has cotton and woolen mills, machine shops, brick works, a butter factory, lumber and cider mills and screen works. Pop. 6,450.

COLCHICINE, a vegetable alkaloid obtained from plants of the genus *Colchicum* (principally from the roots and seeds) by successive extraction with hot alcohol, water and chloroform, and subsequent repeated crystallization from all three of these solvents. It is a yellowish-white powder, with the probable formula $C_{22}H_{25}NO_6$, or $C_{15}H_9.(OCH_3)_3.NH\ COCH_3.COOCH_3$. It acts as a weak base, but most of its compounds are decomposed by water. Preparations of colchicine are used in medicine for the treatment of gout. It is very actively poisonous, half a grain having proved fatal. It causes gastro-intestinal inflammation. No adequate antidote is known.

COLCHICUM, kŏl'chĭ-kŭm, a genus of herbs of the family *Liliaceæ*. About 30 species, natives of the Mediterranean region, have been described. They are nearly all autumn-blooming perennial plants which produce their leaves in spring from corms. The perianth, which resembles but is much larger than that of the crocus, is long and tubular, and varies in color from white to purple (in one species yellow). The leaves, which are broad and long in proportion to the size of the plants, die in early summer, and the flowers appear when nature is preparing for the winter. For this reason the autumn-blooming species are very popular in gardens. They are of easiest culture, the bulbs being planted in late summer and protected in severe climates with a winter mulch of litter or straw, which is removed in the spring. Beds once planted will need no further attention for several years, when they should be dug up, the corms divided and set in fresh soil in a sunny situation. The plants of some species are very acrid and are reputed poisonous, and when cattle have access to them are said to produce injuries of various kinds. The corms and the seeds have been used in medicine for gout and rheumatism. *C. autumnale*, the best-known species, is popularly known as meadow saffron and autumn crocus, names also given to other species.

In medicine the corm and seeds of *Colchicum autumnale* are used. Colchicum has in medicine but one use; that is, in attacks of acute gout. These it cuts short, relieving the pain and shortening the attack better than any other drug. The reasons for this are at present unknown, and the remedy is one of the few now remaining in modern medicine that are still used on empirical grounds only. Poisoning by this drug is not uncommon. The symptoms are those of an acrid gastro-enteric poison, with great pain, nausea, vomiting and diarrhœa. There is marked depression of the pulse and of the respiration, and death is due to shock and collapse. Washing of the stomach is the first indication for treatment, notwithstanding the self-conservative vomiting. Castor oil, heat, alcohol and mucilaginous drinks are indicated.

COLCHIS, kŏl'kĭs, or **COLCHOS**, the ancient name of a region at the eastern extremity of the Black Sea, resting on the Caucasus, and corresponding more or less to the Russian province of Kutais. It is famous in Greek mythology as being the destination of the Argonauts. The people were celebrated for frugality and industry, and from their dark complexion, crispy hair, language and customs, Herodotus is of opinion that they were of Egyptian origin. The country abounded, according to Strabo, in all kinds of fruits and material for shipbuilding. Linen was an important branch of manufacture, and wool of fine quality and in great quantity was produced. It was fruitful in poisonous herbs. In the 15th century it was subdivided into several principalities, and is now comprised in the Russian government of Trans-Caucasus.

COLCOTHAR, red oxide of iron, ferric oxide, Fe_2O_3. The reddish-brown powder that remains in the retorts when ferrous sulphate is distilled in the manufacture of Nordhausen sulphuric acid. It is used for polishing glass, and also as a pigment, under the name of «Indian red.» When in the finest state of subdivision it is known as «rouge,» and is much used for fine polishing by jewelers and others. Colcothar was the *caput mortuum vitrioli* of the alchemists.

COLD. 1. *In physics and physiology,* a relative want of heat. Since there are no determinate boundaries between cold and heat, it is a mere arbitrary distinction to call the degrees of the thermometer below the freezing-point degrees of cold. When the atmosphere, or any substance which comes in contact with the body, is at a lower temperature than the skin, it absorbs heat from the body, and is called cold. The physiological action of cold on the animal organism requires a brief notice. All animals (the warm-blooded animals to the greatest extent) have a certain power of maintaining the heat of the body in defiance of external cold. This power is mainly due to a process analogous to combustion, in which carbon and hydrogen taken into the system in food are made to unite with oxygen derived from the air by respiration. If the combustible materials are not duly furnished, or if the supply of oxygen be deficient (as in various diseased conditions), there must be a depression of temperature. Now, if the temperature of a bird or mammal (except in the case of hibernating animals) be lowered about 30° below its normal standard (which in birds ranges from 100° to 112°, and in mammals from 96° to 102°), the death of the animal is the result. The symptoms indicating that an animal or a man is suffering from a depression of the temperature of the body are: (1) Retardation of the circulation of the blood, causing lividity of the skin, which is followed by pallor, in consequence of the blood being almost entirely driven from the surface through the contracting of the vessels; (2) a peculiar torpor of the muscular and nervous systems at the same time, manifesting itself in an indisposition to make any effort or exertion, and in intense sleepiness. The respiratory movements become slower and the loss of heat goes on, therefore, with increasing rapidity, till the fatal limit is reached and death supervenes. In hibernating animals (the marmot dormouse, bat, etc.) the power of generating heat within their own bodies is very slight, their temperature following that of the external air, so that it may be brought down nearly to the freezing-point. Great or prolonged atmospheric cold is a most powerful depressing agent, and is a fruitful cause of disease and even of death. Whenever the temperature of the atmosphere is suddenly reduced, and particularly when it is reduced below the freezing-point, a considerable addition takes place to the mortality of the region. The effects of cold are, in ordinary circumstances, most apparent among the aged and the very young, and among those suffering from chronic disease.

2. *In medicine,* cold, as well as heat, is frequently employed for its therapeutic value. Cold is one of the most valuable means of obtaining lowered temperature. Cold sponging, ice-packs, alcohol evaporation, are useful in most fevers, are indispensable in sunstroke and very refreshing in minor indispositions. Cold applied to an inflamed area diminishes the blood-tension by contracting the blood vessels, and thus tends to limit inflammation. Cold applied to the skin, as by a wet pack, or as a shower, is a tonic, increasing metabolism, augmenting the appetite and giving mental and physical vigor. Cold applied as iced drinks, or cracked ice itself, is one of the best agents in nausea and gastric distress. Cold by means of ether or ethyl chloride spray is an excellent local anæsthetic for the treatment of local boils, felons, ulcers, etc., and is also used frequently in the extraction of teeth.

Catching cold is a term of wide popular use, and signifies an affection which is little treated of in medical literature, although an affection widespread and unpleasant. Catching cold is a process of disturbed equilibrium of the blood vessels. It is usually due to excessive evaporation from the skin caused by drafts of air, to which is added contraction of the blood vessels of the periphery of the body, with consequent engorgement and congestion in some internal organ. Keeping quiet, taking hot foot-baths, or hot drinks, sweating, etc., are measures that tend to bring the blood to the contracted areas, and away from the congested areas, with consequent good results. If, however, the disturbance becomes marked, if the exposure has been excessive, the congestion in an area becomes so serious that its local functions are diminished or aborted, and the congested blood vessels may be over-distended and paralysis result. Then an inflammatory reaction may ensue; the reduced vitality of the part encourages the multiplication of the ever-ready bacteria, and an acute diseased process may result. It may be a simple acute inflammation of the kidney; or if the pneumococcus is present in the lung, a pneumonia; or it may be a bronchitis. Taking cold is therefore a distinct process that predisposes to more severe affections. In most cases the secondary reaction of taking cold manifests itself in the mucous membrane of the air-passages, and running from the nose, some degree of cough, general malaise, languor and muscular and joint pains are the results. Secondary infection, frequently through the superimposed influenza bacillus (if the condition be not primarily induced by that organism) results in the «grippe,» following which bronchitis and pneumonia are very frequent.

No cold in the head, no general cold should be neglected. Rest in bed, cathartics, hot drinks and medical advice are desirable.

For cold *in physics,* see HEAT; THERMODYNAMICS; GAS, LIQUEFIED.

COLD CREAM, a cooling ointment made according to various recipes, one of which consists in melting four ounces of white wax in one pound of almond oil by means of a gentle heat, mixing gradually with a pint of rose-water in a warm mortar. Another recipe is: Take two parts of spermaceti, two parts of white wax and three parts of almond oil; melt together, and then add rose-water as before. This ointment cools the skin, rendering it soft and pliable, and is successfully applied for the cure of chapped hands.

COLD HARBOR, Battle of. One of the most desperate battles of the Civil War, fought

1 and 3 June 1864, at Cold Harbor, Va. By a series of bloody assaults and flank movements, beginning at the Wilderness 5 May 1864, General Grant had, at the end of the month, forced General Lee back to within a few miles of Richmond, and confronted him on the line of the Totopotomoy. On 31 May his army was along the road from near Hanover Court House to Cold Harbor; the Sixth corps about six miles southeast of the courthouse; to its left, in the order named, the Second, Ninth and Fifth corps, these near Bethesda Church. The Eighteenth corps was at White House, on the Pamunkey, where it had just arrived from the Army of the James. Gen. J. H. Wilson's cavalry division was on the right of Grant's line, and Sheridan, with the two cavalry divisions of Torbert and Gregg, on the left. On the 31st Sheridan, after a severe fight, occupied Cold Harbor, but was so hard pressed by the Confederate cavalry division of Fitzhugh Lee and Clingman's brigade of infantry, and his position so exposed, that he fell back at night; but receiving an order from General Meade that the place must be held at all hazards, he returned, and entrenched during the night. Lee's position was so difficult of access that Grant determined again to extend by his left on Lee's right, and in view of this extension, Cold Harbor was an important point, as there the roads concentrated from Bethesda Church, Old Church, White House, New Bridge and all the bridges across the Chickahominy above and below New Bridge. Grant extended in that direction by transferring from his right. At 11.45 on the night of 31 May, Gen. H. G. Wright's Sixth corps was ordered from its position on the right to march along the rear of the army to Cold Harbor, 15 miles distant, and to be there by daylight on 1 June to support Sheridan, who, it was believed, would be heavily attacked at daybreak; but it was nine o'clock before he arrived, and Sheridan meanwhile had repulsed two determined attacks of Kershaw's division. At 3 P.M. 31 May the Eighteenth corps, Gen. W. F. Smith, was ordered by General Grant to march from White House and form on the right of the Sixth. By a mistake in the order given it, it was late in the afternoon of 1 June when it reached its position. Opposing the two corps were the Confederate divisions of Generals Hoke, Kershaw, Pickett and Field, their main entrenched line about 1,400 yards distant; the interval between mostly open ground. About 300 to 400 yards in advance of the main line was a line of rifle-pits. It was necessary to take this position before General Lee could concentrate on that flank and thus cover this road to Richmond. Between 5 and 6 P.M. Wright and Smith assaulted, and under heavy artillery and musketry fire Smith carried the advanced Confederate works and held them, taking many prisoners. Wright carried the advanced line and, breaking the left of Hoke and right of Kershaw, took parts of the main line, some of which he held, the Confederates falling back to a new line. The loss in the two assaulting corps was about 2,200. On the night of the 1st Sheridan had been ordered to attack on Wright's left, but received the order too late to execute it. On the morning of the 2d he advanced Gregg's division to Sumner's Bridge, on the Chickahominy, attacked a force of infantry, cavalry and artillery, posted near the bridge, carried their advanced position, and held it until Hancock's corps arrived. Hancock's Second corps moved after dark of the 1st from the extreme right, under Meade's order to march with all speed, join Wright by daybreak of the 2d, and take position on his left, extending the line if possible to the Chickahominy. By an error of Hancock's engineer a wrong road was taken, and it was after seven o'clock when his head of column arrived. Then under heavy skirmishing he formed line across the road from Cold Harbor to Dispatch Station. It had been the intention to attack the Confederate line early in the morning. Smith declared that the idea "was simply preposterous." Hancock's men were in an exhausted condition, and the attack was suspended until 5 P.M., and then deferred until 4:30 A.M. 3 June. At this time Grant's line was held on the right by Gen. J. H. Wilson's cavalry from the Pamunkey to Bethesda Church. Warren's Fifth corps, which had not moved, stretched from Bethesda Church about three miles to Beulah Church. Burnside's Ninth corps had been ordered to withdraw from the extreme right and form in Warren's rear to support his right. The Eighteenth corps was on the left of the Fifth, a wide interval between them; the Sixth and Second corps were on the left of the Eighteenth. Lee had observed that Grant was transferring the right of his army, by successive movements, to the left, and not proposing that Grant should take the initiative in attack, took it himself. On the morning of 2 June he ordered Early with three divisions to attack Grant's right flank and drive it down in front of the Confederate line. Early found Burnside in the act of withdrawing from near Sydnor's Mill, to take position in Warren's rear, attacked and captured the skirmish line, which had been left in the works, and fell upon his rear division, by which, with the assistance of the other divisions, Early was checked, but not before he had got in the rear of a part of Warren's skirmish line, from which he took many prisoners. Warren repulsed Rode's division, which had attacked his front, and at night both sides entrenched. The Union losses 1 and 2 June were over 5,000 killed and wounded. Meanwhile Lee closed in to the right and formed his lines in front of Grant's left, his right on the Chickahominy, near Alexander's Bridge, his left extending a little west of north in the direction of the Totopotomoy. A. P. Hill's corps was on the right; Longstreet's, commanded by R. H. Anderson, in the centre; and Early's on the left, cavalry covering both flanks of the infantry. The line included the ground on which was fought the battle of Gaines' Mill, June 1862, and covered all the main roads to Richmond, being about six miles from the main exterior fortifications of the city and but half that distance from its most advanced works. Grant's whole line, except the cavalry on the left, was ordered to assault Lee's lines at 4.30 A.M. 3 June. Wilson, reinforced by 2,000 cavalry and 3,000 infantry, was ordered from Hanover Court House to Hawes' Shop to attack Early's left and rear. The main work was to be done by the Second, Sixth and Eighteenth corps, supported by the Fifth and Ninth. No reconnaissance had been made in front, where the Confederate works were so constructed as to give a cross-fire upon assaulting columns. At the signal the assault was made at 4.30 A.M.

On the left Barlow's and Gibbons' divisions of the Second corps leaped their works and, under a severe fire of artillery and musketry, drove in the enemy's advanced line and, in many places, gained the main line, but the latter was soon retaken and, in 20 minutes from the time the signal was given, the Second corps was repulsed with a loss of 3,000 men, including many of its most promising officers, who were killed on the works. The men did not retreat far, but lay down within a few yards of the Confederate works, and with bayonets, tin cups and plates, began to entrench, skirmishing all the while. It fared no better with the Sixth corps. Its three divisions went forward, carried some advanced rifle-pits, assaulted the main line, and were met by a severe musketry fire and an enfilading artillery fire. They were repulsed with a loss of 800 killed and wounded, but gained positions at some points only 30 or 40 yards from the enemy's works, and held and entrenched them. On the right of the Sixth corps, the Eighteenth was obliged to form one division to the right to protect its flank. Martindale's and Brooks' divisions assaulted and were quickly driven back by a cross-fire of artillery and musketry, and desisted from further effort after a loss of about 1,000 men. In less than an hour the three corps had lost nearly 5,000 in killed and wounded. Warren, on the right, reported that he could not advance unless the troops on his left advanced at the same time. Wright said that if he advanced without a corresponding advance of Smith on his right he would be taken in flank and reverse, and he was waiting for Smith and Hancock to move, and Smith said he could not move unless Wright covered his left flank. General Meade ordered another assault, each corps to go forward without regard to those on the right or left, but it was not made, Hancock would not take the responsibility. Smith had all he could do in holding his own; Wright, also Hancock, merely transmitted the order to brigade and regimental commanders without enforcing it; and the men opened fire from their sheltered positions, without an effort to advance. Meade gave a third order for an advance of the entire line. Smith positively refused to obey, as it meant but a wanton waste of life to attempt it. Wright and Hancock merely transmitted the order, and again the men complied with it only by renewing fire from their positions. Grant got the opinion of his corps commanders that further assault was inadvisable, and at 1.30 P.M. orders were given to entrench «with a view to moving against the enemy's works by regular approaches.» Farther to the right Burnside with the Ninth corps and Warren with the Fifth, who were to support the main assault, attacked Early in the morning, occupied some of the positions taken from him on the 2d, entrenched close up to Early's main line, and were about to assault, when they received orders to suspend attack. They had fought sharply during the morning, the Fifth corps losing about 500 killed and wounded, the Ninth corps about 800. Wilson's cavalry had a sharp engagement at Hawes' Shop, driving the enemy with some loss, and attacking the left and rear of Heath's division; but failing to connect with Burnside, they withdrew to Hawes' Shop. The loss of the Army of the Potomac for the entire day of 3 June was about 7,000 killed and wounded. All night of the 3d both armies were entrenching; no pickets could be thrown out, so close were the lines, between which lay many wounded. Some of the wounded were brought in, but it was not until the 7th that a truce was agreed upon, by which all could be removed, when exposure and starvation had transferred the greater part of them to the death-roll. Regular approaches were made by the Union lines, accompanied by constant and heavy skirmishing; an assault gave no promise of success; and on the night of the 12th Grant withdrew to cross James River. Grant had 103,000 «present for duty» at Cold Harbor. His loss (1–12 June) was 1,845 killed; 9,077 wounded; 1,816 missing; an aggregate of 12,738. Lee had not under his command more than 65,000 men. His loss cannot be accurately given, but probably did not exceed 2,600 killed and wounded. General Grant, in his 'Personal Memoirs,' says: «I have always regretted that the last assault on Cold Harbor was ever made. No advantage whatever was gained to compensate for the heavy loss we sustained.» Consult 'Official Records' (Vol. XXXVI); Grant, U. S., 'Personal Memoirs' (New York 1895); Walker, F. A., 'History of the Second Army Corps'; Humphreys, A. A., 'The Virginia Campaign of 1864–65' (New York 1883); Pennypacker, I. R., 'Life of General Meade'; 'Battles and Leaders of the Civil War' (New York 1887).

E. A. Carman.

COLD LIGHT, a term applied to the illumination produced by a machine, invented by C. F. Dussaud, wherein several incandescent lamps rapidly succeed one another. The underlying principle of the machine is a wheel which carries on its circumference a number of tungsten lamps. When the wheel is rotated each lamp is illuminated at a particular point and again cut off from the current supply, but one lamp being illuminated at one time. When the rotation is rapid the effect on the observer is that of a continuous source of light. The short period during which a lamp is lighted allows but little development of heat, hence the term cold light. The apparatus is useful in connection with a moving picture machine, because it allows the latter to be run at any speed and even to be stopped without danger of igniting the film.

COLD SPRING, N. Y., a village of Suffolk County, on Cold Spring Harbor, and on the Long Island Railroad. It was formerly a whaling port. It is now a summer resort, and has a fish hatchery, laboratories of the Brooklyn Institute and an experimental station of the Carnegie Institute, Washington. Pop. about 800.

COLD STORAGE, a method now generally employed for preserving perishable articles of food by the use of machines which reduce the temperature of the air. The same method is used extensively for preserving articles other than food which are destructible by high temperature. Refrigeration is often called ice-making, but in a cold-storage building the area kept at a certain temperature by the frozen liquid is small compared with that kept at a proper temperature by ammonia and other substitutes for ice. Perhaps no produce ever came into common use more rapidly than air treated according to the cold-storage method, unless electricity or steam be excepted. It is now indispensable in connection with some of the largest business enterprises, which, without it, would soon cease to exist. One of the most important uses of cold storage is in the transportation of beef, fruit and vegetables, etc., from place to place and from one country to another, especially from the United States and South America to Europe.

The extensive systems employed in breweries, provision depots, dairies and distilleries have familiarized the public with the use of cold air; and no modern hotel or apartment house on a large scale is constructed without a plant for producing it by some process. It is as much a portion of the mechanical equipment as the elevator motor, or the lighting and heating apparatus. It is also being introduced for cooling purposes in theatres and other auditoriums; it maintains a pleasant temperature during the heated term in the hospital ward, and several companies have been formed to distribute it in cities through mains, as water and gas are supplied to the consumer. In some of the largest packing-houses of Kansas City and Chicago, not a pound of ice is used in a year for preservative purposes, although every department where the products of the beef, sheep and hog are stored any length of time is required to be at a temperature near or below the freezing point. Plants are now being made in this country to generate cold air for butter and butterine factories, ice-cream factories, chemical works, sugar refineries, molasses factories, paraffine works, oil refineries, stearine factories, chocolate factories, morgues, office buildings, skating rinks, steel-tempering plants, blast-furnaces, laundries, glue works, dry-plate works, dynamite-works, paint factories, soap factories, fur storage, India-rubber works and plants for seasoning lumber — a list including some of the country's most important industries.

While an extensive variety of machinery is being manufactured for refrigeration under a score of patents, the aim of all the inventors is the same — to perfect the most economical process to remove the heat from a certain temperature level to a higher level, discharging it at this point. With one ton of coal, a cold-air equivalent of from 8 to 14 tons of ice has been produced, the quantity varying according to the process employed. In the United States the refrigerating machines use anhydrous ammonia as the agent for generating low temperatures, mostly in conjunction with brine made from chloride of calcium and water. The ammonia is circulated through a series of pipes in which it evaporates. Then, in its gaseous form, it is pumped by the machine into the condensers and liquefied. The brine-cooler consists of a double pipe-coil. A small quantity of ammonia is injected through a needle valve, which allows a very fine stream to pass into the space between two pipes, running in a coil approximately 300 feet long surrounding a pipe containing the brine. From this coil the ammonia gas is drawn to the machine. The gas is forced thence into other coils, called the ammonia condensers, which have water circulating over them. It is now in a heated condition from the compression. The water running over these coils cools off the gas, and at the same time condenses it into liquid anhydrous ammonia. In this form the ammonia is conducted to a receiving tank, and from there it again passes through the needle-valve into the brine-cooler, going through the same circuit again and again. The brine-cooler represents the apparatus where the brine and ammonia systems are in conjunction, the brine being pumped through the cooler, and from there through coils of pipe in the room in which it is desired to reduce the temperatures. This is sometimes to 20° F. below zero for freezing fish, sometimes to 32° F. for preserving meat, and often to 50° F. for preserving fruits and other perishables. The temperature is easily adjusted to the required degree by controlling the brine-flow in the piping. By lessening or increasing the flow in a single pipe, a wide range of temperature can be produced. Thus the same room can be used either for freezing the articles it contains, or merely for chilling them.

The capacity of a refrigerating machine is based upon the weight of ammonia in the gaseous form which it can discharge in 24 hours, each pound of gas representing a certain quantity of heat-absorbing power. The unit of capacity is the refrigeration which would be accomplished by the use of one ton of ice. Such a quantity will lower the temperature of 28,400 pounds of water 10 degrees. Therefore, if a «one-ton» machine is employed, it will cool 197⅕ pounds of water to the extent of one degree a minute. Tests made of the York type machines of this capacity show that one will keep the «curing» department of a packing-house containing 12,000 cubic feet of space, at a temperature of 40° F. or 1,500 cubic feet at zero. In other words, it is sufficient to keep 10 beeves or 25 hogs chilled at the former temperature. As a single plant used in the large packing-houses and breweries may represent 500 tons capacity, it will be seen that the cold storage compartments are maintained on a very elaborate scale, a single one containing thousands of carcasses. The horse power required for one of these large machines aggregates 625. The air-compressors are built in various designs, and are known as single and double acting. A recent invention, the Westinghouse-Leblanc refrigeration machine, represents a new process that is now being introduced, which involves the use of water vapor for producing a temperature of from 35° F. to 50° F.

In large cold-storage warehouses the floors are not over eight or nine feet high. The pipe is attached to the walls, and in wide rooms to the sides of posts running through the middle of the room, so that an equal temperature can be maintained in all portions. In others, like fish-freezing rooms, the pipes are even used as shelves to hold the tins filled with fish, which are frozen into bricks and piled away in another compartment. Poultry and game are also kept in a frozen state, and the meat remains almost as hard as stone while in the cold room. Butter also is kept at a temperature near zero, which is said to preserve the flavor contained in its volatile oil, so that it is equal to fresh butter. Eggs are preserved sometimes from two to six months, but require particular care. The air in the room should be neither too moist nor too dry, and the chamber should be neither without ventilation nor supplied with too much, as then the eggs would lose in weight on account of their liability to evaporate through the shell. Eggs, butter and milk are also liable to be tainted by any smell arising from the woodwork, or articles stored in the neighborhood, and the rooms have to be constructed and arranged with this point in view.

The above, it may be said, have been problems for the cold-storage experts to solve by practical experiments; but food products can be preserved in properly constructed houses with as little difficulty as any other articles. In the preservation of meat, from the time that the beef, sheep or hog is killed, it is kept in cold storage or «chill» rooms, until the time that it is taken from the refrigerator to be prepared for the table. The «chill» rooms are used to take the animal heat out of the meat, and reduce its temperature from about 98° F. to cold-storage temperature, that is, from 32° F. to 40° F. For this purpose the meat is hung on rails in rooms which have chambers in the upper part over the rails for ammonia or brine piping, which reduces the temperature to a point near freezing before the meat is put in. After the meat is put in, the animal heat it still contains raises the temperature in the room, but this is again gradually lowered, in the course of 24 to 48 hours, to the proper degree for refrigeration. This length of time is required in order to chill the meat thoroughly. Should it become chilled on the outside and remain warm in the centre, the centre part of the meat would be spoiled. From the «chill» room the meat is run into the cold-storage rooms and hung on rails, where it is kept until such time as it is to be shipped. The choicest pieces are kept at least four weeks in cold storage, as the quality is thus improved, and, if the rooms are kept clean, these pieces will taste better than meat which has been recently slaughtered. For this reason, not only slaughter-houses, but depots of packers and other buildings where meat is kept in cold storage, even to small butcher establishments, are preferably cooled by refrigerating machinery, owing to its drying and cleanliness.

In some of the large hotels refrigerators cooled by machinery are even placed close to the ovens or ranges where the viands are prepared for consumption, the refrigeration being maintained at the proper standard despite the outside temperature. High temperature is also the rule in candy factories, but manufacturers of chocolate candy have been using refrigerating machines for some time. They are forced to do this, as the compound is apt to become soft in hot weather, which, of course, would spoil the appearance of the goods for the market. The arrangement of the refrigerating piping for chocolate factories has been made in various ways. In some instances a large refrigerator is cooled in the centre of the workroom with the piping inside of it, this refrigerator being of such length that endless belting carrying tins with chocolate enters it on one side and brings them out chilled on the other. In other workrooms a series of pipe coils are simply placed along the ceiling, and the cold air coming down chills the confectionery as it is made by the employees in the same room. The chocolate is then stored in refrigerators, apart from the workroom, and there properly packed at a low temperature. After being packed it can be sent out, and ordinarily will keep for an indefinite length of time.

One of the most interesting applications of cold storage, however, and one which has become very extensive, is for preserving furs and woolens, which are kept at a temperature of not over 20° F. to keep the moths from destroying them. These rooms have a very interesting appearance, as among the trunks, boxes and drawers of clothing there appear figures of bears, tigers and other stuffed animals in threatening attitudes, put away through the hot season by their owners and taken out in the fall. Sometimes furs are left in storage continuously for several years, yet at the end of the time they are invariably found in perfect condition. Many of the trust companies in the larger cities have such cold storage compartments. In these fur and clothing rooms, where valuable carpets and rugs are also stored, the air is generally cooled outside of the room and circulated through it by means of fans.

The cold storage building erected by the United States government at Manila is probably unexcelled in scientific construction. It has a storage capacity for 1,200 tons of beef, 200 tons of mutton, 50 tons of butter, 100 tons of potatoes and 100 tons of bacon; or, in other words, sufficient food to feed an army of 10,000 men for three months. In addition to the ordinary freezing apparatus it has an ice plant with a daily output of 40 tons. The elevator, with its 2,400 pound lifting capacity, as well as most of the other appliances in the building are operated by electricity. Connecting with the elevator is an overhead tracking system extending four miles, and the mechanism is so complete that a ship landing at a near-by pier has only to open her hatches and her cargo is transported to the storage almost automatically. The power in the building is furnished by three 200-horsepower engines. Consult Levey, 'Refrigeration Memoranda' (1906); Macintire, 'Mechanical Refrigeration' (1914); Cooper, M., 'Practical Cold Storage' (1914).

COLD WAVE, a term commonly used in the United States to denote a fall of at least 20° in temperature in 24 hours, bringing the temperature below the freezing point. It is due to steady winds from the northwest, which bring with them the chill conditions of the great west Canadian plains. This chill seems due to anti-cyclonic conditions which bring down to the surface the cold air of the upper atmosphere, and cause it to flow out over the southern and eastern United States. «Cold wave» is a term first used by the United States Weather Bureau in 1872. On account of the comparative shallowness of the cold wave it seldom rises to a height much above 3,000 feet above sea-level. Spread like a great sheet over the earth, it moves onward steadily and surely so that the weather bureau is generally able to forecast its movements 24 hours ahead of its arrival in any given district. As it proceeds onward the cold wave forces the warmer air above it. Popularly the cold wave is known in the United States and Canada (where it originates) as northers and along the Spanish coast of the Gulf of Mexico as «el norte.»

COLDEN, kōl'dĕn, **Cadwallader**, American scientist and colonial official: b. Dunse, Scotland, 17 Feb. 1688; d. Long Island, N. Y., 28 Sept. 1776. He was graduated from the University of Edinburgh in 1705, and emigrated to the American colonies in 1708. He devoted himself to botany and astronomy and also to public affairs, becoming surveyor-general of New York and president of the council. He sided with the Crown in the contest over the Stamp Act. Among his correspondents were Franklin and Linnæus, and he wrote 'Cause of Gravitation' and 'History of the Five Indian Nations.'

COLDEN, Cadwallader David, American lawyer and nephew of Cadwallader Colden, the naturalist: b. near Flushing, L. I., 4 April 1769; d. Jersey City, N. J., 7 Feb. 1834. He studied law and began practice in New York in 1791, where he soon attained high rank in his profession. He was a member of the legislature and mayor of New York (1818), a member of Congress (1821), and of the State senate (1824–27). He was an earnest advocate of the system of internal improvements that was an important political issue early in the 19th century and of public education. He wrote 'Life of Robert Fulton' (1817); 'Vindication of the Steamboat Right Granted by New York State' (1819); 'Memoir of the Celebration of the Completion of the New York Canals' (1825).

COLDSTREAM, Scotland, town in Berwickshire, 13 miles southwest of Berwick, situated on the northern bank of the Tweed, which is here crossed by a bridge (erected by Smeaton in 1766) that unites the two kingdoms, and forms a well-frequented thoroughfare. The ford of Coldstream was a favorite point with the invading armies of England and Scotland when they passed alternately into each other's country. The Coldstream Guards, the second oldest regiment in the British army, was embodied here by General Monk (1659–60). Pop. 1,375.

COLDSTREAM GUARDS, a regiment in the Foot Guards or Royal Household Brigade, the oldest in the British army except the First Foot, now called the Royal Scots. Raised in 1660 by General Monk at Coldstream, it was at first called "Monk's Regiment," but when Parliament consented to give a brigade of guards to Charles II, this corps, under the name of Coldstream Guards, was included in it. It has seen service in every war of importance in which Great Britain has been engaged since its organization and its military record is looked upon as one of the most brilliant in the British army.

COLDWATER, Mich., city and county-seat of Branch County. It is in the southern tier of counties, 153 miles east of Chicago and 126 miles west-southwest of Detroit, on the Coldwater River and the Lake Shore and Michigan Southern Railway. Coldwater was first settled in 1830 by Hugh Campbell, became a borough in 1837 and a city in 1862. It is governed by a mayor and a common council of eight members, four members of which are elected yearly for a term of two years. The city has three banks, churches of all denominations, is in the centre of a rich farming community, has cement, shoe, wagon, milling and other industries, and owns and controls its waterworks and electric-light plant. It contains the Bromo-Hygeia Mineral Wells. Pop. 5,945.

COLE, Alfred Dodge, American physicist: b. Rutland, Vt., 18 Dec. 1861. He was graduated at Brown University in 1884. He also studied at Johns Hopkins, Harvard, Berlin, Cornell and Chicago universities. He was instructor in chemistry and physics 1885–87, acting professor 1887–88, and professor 1888–1901 at Denison University. In 1901–07 he was professor of physics at Ohio State University, in 1907–08 at Vassar College, and since 1908 professor of physics and head of the department at Ohio State University. In 1901–07 he was a trustee of Denison University and again after 1911. He is the author of various researches on electric oscillations, electric waves, capillary electrometer, impact excitation, infra-red radiation, etc., in *Physical Review* and other periodicals.

COLE, Asahel N., American agriculturist and editor: b. 1821; d. Wellsville, N. Y., 14 July 1889. He figured prominently as a Republican in the party's early days, and in 1852 he founded the *Genesee Valley Free Press,* the pioneer Republican paper. He was noted as an agriculturist, and known as the father of subsurface irrigation.

COLE, Frank Nelson, American mathematician: b. Ashland, Mass., 20 Sept. 1861. He was graduated at Harvard in 1882, lectured on mathematics there in 1885–87 and became instructor and assistant professor of mathematics at the University of Michigan in 1888–95. In the latter year he became professor of mathematics at Columbia University. He became secretary of the American Mathematical Society in 1895 and editor of its *Bulletin* in 1897.

COLE, George Vicat, English landscape artist: b. Portsmouth, Eng., 1838; d. London, 6 April 1893. He was a pupil of his father, George Cole (1810–83), a landscape painter also, was especially noted for his studies from nature in Surrey, and became a royal academician in 1880.

COLE, George Watson, American bibliographer: b. Warren, Conn., 6 Sept. 1850. He was educated at Phillips Academy, Andover, Mass., and was admitted to the bar in 1876. He practised until 1885 when he became cataloguer of the Fitchburg Public Library. In 1891–95 he was librarian of the Free Public Library, Jersey City, N. J. He resigned to devote himself to bibliographical work. Since 1915 he has been librarian of the private library of Henry E. Huntington of New York. He is the inventor of a size card for measuring books in accordance with the standard adopted by the American Library Association, which is in general use. He has published 'Catalogue of Americana' in the Library of E. Dwight Church, New York (5 vols., 1907); 'Bermuda in Periodical Literature' (Boston 1907); 'Catalogue of English Literature and Miscellanea' in the E. Dwight Church Library (2 vols., 1909); 'First Folio of Shakespeare' (1909); 'Book-Collectors as Benefactors of Public Libraries' (1915); also articles in periodicals on bibliography, libraries and library economy.

COLE, Grenville Arthur James, English geologist: b. London, 21 Oct. 1859. He was educated at the City of London School and the Royal School of Mines, and has been professor of geology at the Royal College of Science for Ireland since 1890. He has published 'Aids in Practical Geology' (1891); 'The Gypsy Road' (1894); 'Open Air Studies' (1895);

‘As We Ride’ (with Blanche Cole, 1902). ‘The Changeful Earth’ (1911); ‘Rocks and their Origins’ (1912): ‘The Growth of Europe’ (1914); ‘Ireland, the Land and the Landscape’ (1915).

COLE, King, a legendary British king, described as a «merry old soul,» fond of his pipe, and fond of his «bowl,» and fond of his «fiddlers three.» Colchester is said to have been his residence. Tradition says that he took Camulodunum from the Romans and named it the «Camp of Cole,» which became Colchester. Another tradition says that Helena, the daughter of King Cole, was the mother of the Emperor Constantine.

COLE, Thomas, American landscape painter: b. Bolton-le-Moor, England, 1 Feb. 1801; d. Catskill, N. Y., 11 Feb. 1848. In 1819 his father and family emigrated to America. Here Cole began work as a wood engraver in Philadelphia, while his family went on to the West. In 1820 he followed them to Steubenville, Ohio, where he spent two years. He helped his father's wallpaper business by mixing colors and designing patterns. But he had always delighted in natural scenery and he was greatly interested in the surrounding landscape. His attention turned to painting and after a while he left home and after some wandering he came to New York in 1825. Here after a winter's work he sold some pictures, which enabled him to make a trip up the Hudson, already famous for its picturesque and romantic scenery. On his return he sold three pictures to Colonel Trumbull, William Dunlap and A. B. Durand, and this introduction gave him a definite position in American landscape painting, where he soon became a leader. In 1829, feeling a need for study of the recognized masters of landscape he went abroad. He went first to England and then to Italy. For almost four years he painted earnestly and studied the works of the painters whom he admired. He did not, however, attach himself to any one master nor did he copy many paintings; he received impressions on art and formed ideas but did not labor for advance in any particular kind of technical skill. The results of his tour were natural. Before leaving America he had had for his chief ideal the presentation of nature as he saw it. While he was abroad his mind turned more to a rendering of thoughts and ideas. On his return to America he painted the series of pictures called ‘The Course of Empire’ and some years afterward another series called ‘The Voyage of Life,’ besides a number of other pictures in which his conceptions and ideas found almost allegorical expression. He also painted many purely American landscapes which became widely known, but the ideal pictures he came to think his greatest and most representative work. The general estimate, however, has been different; these ideal works have been neglected and Cole's chief work has been found in his purely American landscape. Cole will always be thought of as the leader of those earlier artists who devoted themselves to a presentation of the natural beauty of their country with a genius and a skill that delighted their own day and gave rise to a movement that has become rather the most characteristic thing in American painting. Cole was the leader and representative of the first group of American landscape painters, often loosely called the «Hudson River School.» The latter part of his life he lived at Catskill, N. Y. There is no recent life of Cole. ‘The Life and Works of Thomas Cole’ by L. L. Noble, written shortly after Cole's death, gives a valuable but contemporary view.

COLE Timothy, American engraver: b. London, England, 1852. He came to America in 1857 and was rendered penniless by the Chicago fire in 1871. He studied under Bond and Chandler and in 1875 entered the employ of the *Century Magazine* (then *Scribner's Monthly*). In 1883 he was sent to Europe to engrave pictures by the old masters. His first series ‘The Old Italian Masters’ was finished in 1892. The Dutch and Flemish series followed in 1896 and the English in 1900. The ‘Old Spanish Masters’ was begun in 1902 and completed in 1907. The French series followed in 1910. Since 1914 he has been engaged on the old masters in American public and private galleries. He has received first-class medals at every exposition since 1893; is a member of the American Society of Arts and Letters. In 1914 he received the degree of M.A. from Princeton University. He stands easily at the head of living wood engravers. He is most effective in his use of the white line and in reproducing textures; his results in general are produced by conservative methods, in the employment of which he has gained breadth and power and appreciation of light and of the personality of his subject. Consult Weitenkampf, ‘American Graphic Art’ (New York 1912). He wrote ‘Notes to Old Italian Masters’ (1889–92); ‘Monograph on the Lives of Dutch Masters’ (1892–96); ‘Notes to English Masters’ (1897–1901).

COLE, William Morse, American teacher: b. Boston, Mass., 10 Feb. 1866. He was graduated at Harvard in 1890, and was instructor in political economy there 1890–93. From 1894 to 1898 he was a university extension lecturer and secretary of the Massachusetts commission on the unemployed. From 1898 to 1908 he taught English in Massachusetts high schools and accounting in Harvard University. Since 1908 he has been assistant professor and associate professor of accounting at Harvard. He is the author of ‘An Old Man's Romance’ (1895), under the pseudonym of «Christopher Craigie»; ‘Accounts: their Construction and Interpretation’ (1908); ‘The American Hope’ (1910); ‘Accounting and Auditing’ (1910); ‘Cost Accounting for Institutions’ (1913); ‘Accounts’ (revised and enlarged, 1915); ‘Problems in the Principles of Accounting’ (1915).

COLEBROOK, Henry Thomas, English Sanskrit scholar: b. London, 15 June 1765; d. there, 10 March 1837. In 1782 his father's influence procured him a writership in the Bengal service. His duties as revenue officer at Tirhut led him to make a minute study of the state of husbandry in Bengal; his legal functions led him to study Indian law and learn Sanskrit; and he began in 1794 publishing essays on Indian religion, poetry and science in the ‘Asiatic Researches’ of the Asiatic Society of Calcutta. His removal in 1795 to the magistracy of Mirzapur gave him the opportunity of cultivating the acquaintance of the learned men of the neighboring Sanskrit college at Benares, and with this advantage he brought out his

'Digest of Hindu Law on Contracts and Successions' (1798). A mission to Nagpur (1799–1801) interrupted his work and on his return he was appointed a judge of the new Court of Appeals at Calcutta and at the same time honorary professor of Hindu law and Sanskrit at the college of Fort William. Yet he contrived during this busy period to publish the first (and only) volume of his 'Sanskrit Grammar' (1805), based upon Pánini and the native commentators, to write his famous articles on the Vedas and on the sect of Jains, besides many other valuable essays for 'Asiatic Researches,' and also to supplement his 'Digest' by 'Two Treatises on the Hindu Law of Inheritance' (1810). He became blind in his later years. His 'Life' was published by his son in 1873. Colebrook is noteworthy as the first great Sanskrit scholar in Europe.

COLEMAN, Arthur Philemon, Canadian educator: b. Lachute, Quebec, 4 April 1852. He was educated at Victoria University and at the University of Breslau. After some years of scientific work he became professor of geology and natural history in Victoria University; in 1891 professor of assaying and metallurgy in the School of Practical Science, Toronto; and from 1901 professor of geology, Toronto University. He was geologist for the Ontario bureau of mines from 1893–1909.

COLEMAN, Caryl, American ecclesiologist: b. Buffalo, N. Y., 1847. He was educated privately and at Canisius College, Buffalo. From 1872 to 1874 he was a teacher in Buffalo, N. Y., and in 1875–76 studied ecclesiology in Europe, prosecuting these studies further in England and Belgium in 1888. In 1889 he opened the church department of Tiffany & Company and directed it for 10 years. He founded the Church Glass and Decorating Company, of which he has since been president, and was appointed American representative of John Hardman & Company of Birmingham, England. He has written 'Symbolism in Religious Art' (1899); 'A Mark of Honor' (1903); 'The Sacred Ciphus' (1903); 'A Day with Mary' (1908). He was a contributor to Russel Sturgis' 'Dictionary of Architecture' and to 'The Catholic Encyclopedia' and has contributed articles on the decorative arts, symbolism, iconography and architecture to the *Architectural Record* and other periodicals.

COLEMAN, John, American clergyman: b. Baltimore, Md., 11 Feb. 1803; d. Saint Louis, Mo., 16 Sept. 1869. Until 1834 he was a Methodist. He entered the Protestant Episcopal ministry in 1836 and for 20 years was rector of Trinity Church, Philadelphia. He edited the religious paper *Banner of the Cross* (Philadelphia); and also edited Faber's 'Difficulties of Romanism'; and Wilmer's 'Episcopal Manual.'

COLEMAN, Leighton, American Protestant Episcopal bishop: b. Philadelphia, 3 May 1837; d. Wilmington, Del., 14 Dec. 1907. He was graduated at the General Theological Seminary in 1861, was ordained to the Episcopal ministry in 1862, and after holding important rectorships was consecrated bishop of Delaware in 1888. He wrote 'A History of the Lehigh Valley' (1872); 'The Church in America' (1895); 'The Church in the United States' (1901).

COLEMAN, Lyman, American clergyman and scholar: b. Middlefield, Mass., 14 June 1796; d. Easton, Pa., 16 March 1882. He graduated at Yale 1817; taught in Hartford, Conn., 1817–20; was tutor in Yale 1820–25, studying theology at the same time. He was pastor of the Congregational church in Belchertown, Mass., for seven years, when he again took up teaching. He studied in Germany 1842–43, where he formed a close friendship with Neander, and returning, taught German at Princeton and Amherst 1845–46. In 1856 he traveled extensively through the Orient. He was professor of Latin and Greek in Lafayette College from 1861 to 1868, when he was transferred to the chair of Latin, which he held until his death. His writings, which were highly praised and regarded in their day, are 'Antiquities of the Christian Church' (1841), translated from the German; 'The Apostolical and Primitive Church' (1844); 'Historical Geography of the Bible' (1850); 'Ancient Christianity' (1852); 'Historical Text-Book and Atlas of Biblical Geography' (1854; rev. ed., 1859); 'Prelacy and Ritualism' (1869); and 'Genealogy of the Lyman Family in Great Britain and America' (1872).

COLEMAN, William Tell, American pioneer: b. Cynthiana, Ky., 29 Feb. 1824; d. San Francisco, Cal., 22 Nov. 1893. In 1849 he made the overland trip to California and opened several stores for the sale of mining supplies. When in 1851 the famous Vigilance Committee of San Francisco was formed to rid the city of its formidable criminal element, Coleman became one of the most active members. In 1856 the committee was revived in consequence of the murder of James King, an editor; Coleman took charge of the trials, resisted official pressure against interfering with "the people," directed the execution of Casey and the other murderers and carefully avoided any clash with the United States authorities. From 1857 to 1864 he directed his business from New York, aided in suppressing the draft riot and contributed liberally to patriotic benefactions. In 1877–78, at the request of the citizens of San Francisco, he organized the Committee of Safety, to fight Dennis Kearney and his sand-lots mob, and in this was highly successful. In 1888 his firm failed with liabilities of $2,000,000, but in 1892 he personally paid off his entire indebtedness.

COLEMAN, Canada, town in the Macleod district, on the Old Man River and on the Canadian Pacific Railway, 10 miles from Crow's Nest Pass. It is a coal and coke centre, these industries giving employment to about 1,000 men. The town has waterworks, an electric-lighting plant and banking facilities. Fishing and hunting in the vicinity are both good. Pop. 1,557.

COLEMAN, Tex., city and county-seat of Coleman County, 120 miles southwest of Fort Worth, on the Gulf, Colorado and Santa Fé Railroad. Beef, cotton and grain are important articles of trade. There are brick-works and nearby are deposits of coal and oil gas. The city owns the waterworks and electric-lighting plant. Pop. 3,046.

COLEMANITE, a hydrous borate of calcium, $2\,\text{CaO}, 3\,\text{B}_2\text{O}_3 5\text{H}_2\text{O}$. The most common source of borax and boracic acid in the United States. Principal deposits are in California.

COLENSO, John William, English clergyman, bishop of Natal: b. Saint Austell, Cornwall, 24 Jan. 1814; d. Bishopstowe, Natal, 20 June 1883. He was educated at Saint John's College, Cambridge; was assistant-master at Harrow 1838–42; resided at Saint John's College 1842–46, when he was preferred to the rectory of Forncett Saint Mary, Norfolk, and on 20 Nov. 1853 was appointed the first bishop of Natal. His numerous writings extend over a wide field. His treatises on arithmetic and algebra have become textbooks in schools and universities. In 1853 he published a collection of 'Village Sermons'; in 1855 'Ten Weeks in Natal'; and in 1861 a 'Commentary on Saint Paul's Epistle to the Romans.' In the following year public attention was widely attracted by the first part of his work on 'The Pentateuch and Book of Joshua Critically Examined,' in which the historical accuracy and Mosaic authorship of those books were called in question. This work was condemned as heretical by slight majorities in both Houses of Convocation of the province of Canterbury in 1864, and Colenso was declared to be deposed from his see by his metropolitan, the bishop of Cape Town. The deposition was, however, declared null and void on appeal to the Privy Council in March 1865. Notwithstanding this decision the prelates forming the council of the Colonial Bishoprics Fund refused to pay him his income and he appealed to the Court of Chancery. The master of the rolls delivered judgment on 6 Oct. 1866, ordering the payment in future of his income, with all arrears and interest, but declaring that if his accusers had refused payment on the ground of heretical teaching he should have felt it his duty to try that issue, an offer which they declined to accept. One of the results of this ecclesiastical quarrel was that the Anglican community of the Cape was divided into two hostile parties; Colenso still remained the only bishop of the Church of England in Natal, but the Rev. W. K. Macrorie was consecrated bishop of Maritzburg for the Church of that province of South Africa 25 June 1869. About the end of 1874 Colenso visited England, and during this visit he pleaded before the Secretary for the Colonies and other members of the government the cause of Langalibalele, a Zulu chief, who had been dispossessed of his territory and imprisoned at Cape Town. From that time forward the humane bishop was foremost in advocating the cause of the aboriginals against the oppression of the Boers and the encroaching policy of the Cape officials supported by Sir Bartle Frere. The captive Cetewayo (see Zululand) appealed to Colenso to place his case before the English people, and it was mainly owing to the bishop's efforts that the Zulu king was allowed to go to England to plead his own case with the ministry. In the meantime Colenso continued his literary labors. 'The New Bible Commentary by the Bishops and Other Clergy of the Anglican Church Critically Examined' was published in 1871, the seventh and last part of his work on the Pentateuch in 1879, and 'Lectures on the Pentateuch and Moabite Stone' in 1873. Consult Cox, 'Life of Bishop Colenso' (1888).

COLEPTERA (Gr. *koleós,* a sheath, and *πτερόν,* a wing), an order of insects, the species of which are commonly known by the name of beetles. The insects which constitute the order *Coleoptera* may be characterized as having four wings, of which the two superior are not suited to flight, but form a covering and protection to the two inferior, and are of a hard and horny or parchment-like nature and when closed their inner margins, which are straight, touch and form a longitudinal suture. The inferior wings, when not in use, are folded transversely under the superior and are membranous. The appendages of the mouth are well adapted for cutting and the metamorphosis is complete. See Beetle.

COLER, Alwin Gustav Edmund von, German army surgeon: b. Groningen 1831; d. 1901. He studied medicine in Berlin, entered the Prussian army in 1856, became surgeon-general in 1874 and chief surgeon of the general staff in 1889. He introduced several important reforms and improvements in military hygiene, established the corps of sanitary officers and introduced antiseptics into military surgical practice. He also took a prominent part in formulating the medical regulations for the German army, which have since been adopted by all civilized armies. In 1892 Coler was appointed professor at the University of Berlin. He published 'Sanitätsbericht über die deutschen Heere im Kriege 1870–71'; 'Veröffentlichungen aus dem Gebiete des Militär-sanitätswesens' (1892); 'Die transportable Lazarettbaracke' (with Langenbeck and Werner, 1890).

COLER, Bird Sim, American politician: b. Illinois 1868. He removed to New York, and with his father established the stock-broking firm of W. N. Coler & Company. He became active in Democratic municipal and State politics, was elected comptroller in the first administration of Greater New York under the new city charter (1897–1902) and was Democratic candidate for governor of the State in 1902. In 1905 he was elected president of the borough of Brooklyn on the municipal ownership platform. He has written 'Municipal Government, as Illustrated by the Charter, Finances, and Public Charities of New York' (1900); 'Socialism in the Schools' (1911); 'Two and Two Make Four' (1912).

COLERAINE, kōl-rān', Ireland, town in the county of Londonderry, situated on both sides of the river Bann, about four miles from its mouth, and 61½ miles northwest of Belfast by rail. It has long been celebrated for its fine linens. Its trade, chiefly in agricultural produce and provisions, is considerable; there is a large distillery, and it has a valuable salmon fishery. Pop. 7,785.

COLERIDGE, Hartley, English poet: b. Clevedon, near Bristol, 19 Sept. 1796; d. Rydal, Westmoreland, 6 Jan. 1849. He was the eldest son of S. T. Coleridge (q.v.), and upon the elder Coleridge taking up his residence in the Lake district, Hartley and his brother Derwent were placed as day scholars under the charge of a clergyman at Ambleside. In 1815 he became a student at Merton College, Oxford, and having inherited his father's conversational talents, was soon in great request at the wine parties and other festivities of the undergrad-

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uates. An unfortunate propensity was thus formed for drinking, which proved even more ruinous than his father's craving for opium. He obtained a fellowship at Oriel College, but forfeited it on account of his intemperance before the close of his probationary year. He then left Oxford and resided for two years in London, contributing occasionally to the *London Magazine,* in which his first sonnets appeared. His friends induced him against his will to settle at Ambleside for the reception of pupils, but this scheme, as might have been expected, failed. He continued, however, to reside in the Lake country, and during this period enjoyed the friendship and good offices of Wordsworth, who had taken a paternal interest in him from a child. He likewise employed himself extensively in study and literary composition, contributing to *Blackwood's Magazine,* and producing a volume of 'Poems' and 'Worthies of Yorkshire and Lancashire.' Many of his sonnets will rank with the finest in the English language, while the charming vivacity of his biographies leaves only room for regret that he had not accomplished more as a prose writer. In 1839 he wrote a life of Massinger for an edition of his works published by Moxon. He was buried in Grasmere churchyard, adjoining the spot where Wordsworth was laid a few months afterward. A memoir, with a collection of poems written by him in his later years, was published after his death by his brother Derwent.

COLERIDGE, Henry Nelson, English writer: b. Ottery Saint Mary, 25 Oct. 1798; d. 26 Jan. 1843. He was a nephew of S. T. Coleridge (q.v.) and was educated at Eton and King's College, Cambridge. Having accompanied, in 1825, his uncle, the bishop of Barbados, on a voyage to that island, on his return he published an account of his sojourn, under the title of 'Six Months in the West Indies.' He was called to the bar in 1826, and shortly afterward married his cousin Sara, only daughter of Samuel Taylor, and sister to Hartley Coleridge. In 1830 he published an 'Introduction to the Study of the Greek Classic Poets,' and after his uncle's death set himself to the task of committing to writing the reminiscences of Coleridge's conversation, which were published under the title of 'Specimens of the Table-talk of the late Samuel Taylor Coleridge.' He was his uncle's literary executor and edited his posthumous writings including three volumes of 'Literary Remains,' published in 1836 and 1838, and 'Confessions of an Inquiring Spirit,' in 1840.

COLERIDGE, Herbert, English philologist: b. Hampstead, England, 7 Oct. 1830; d. London, 23 April 1861. He was a son of Henry Nelson Coleridge (q.v.), and was one of the original planners of the dictionary outlined by the Philological Society and which in subsequent years has expanded into the 'New English Dictionary on Historical Principles,' now being issued from the Clarendon Press, Oxford.

COLERIDGE, John Duke Coleridge, 1st Baron, Lord Chief Justice of England: b. London, 3 Dec. 1820; d. 14 June 1894. He was the eldest son of Sir John Taylor Coleridge (q.v.), judge, who was a nephew of Samuel Taylor Coleridge. He was educated at Eton and Balliol College, Oxford, and was called to the bar at the Middle Temple in 1846. In 1855 he was appointed to the recordership of Portsmouth; from 1865 till 1873 represented Exeter in the House of Commons as a Liberal, and in 1868 he became solicitor-general under Mr. Gladstone, being knighted at the same time. Three years later he became attorney-general, and in 1873 he was appointed chief justice of the Court of Common Pleas. In the same year he was raised to the peerage as Baron Coleridge of Ottery Saint Mary, and in 1880 succeeded Sir Alexander Cockburn as Lord Chief Justice of England. Lord Coleridge distinguished himself very highly when acting as chief counsel for the Tichborne family in the famous trial of 1871–72. He was the first lord chief justice who was granted the office with the present title, instead of the older one of lord chief justice of the Court of Queen's Bench.

COLERIDGE, Sir John Taylor, English jurist and author, a nephew of the poet, Samuel Taylor Coleridge: b. Tiverton, England, 1790; d. Ottery Saint Mary, 11 Feb. 1876. He was educated at Oxford, and was called to the bar of the Middle Temple in 1819. In 1835 he was appointed justice of the King's Bench, and was sworn of the Privy Council in 1858. He was, for a time, editor of the *Quarterly Review.* As a literary critic he took high rank, and besides editing an edition of 'Blackstone's Commentaries' (1825) published 'Public School Education' (1860); 'Life of John Keble' (1869).

COLERIDGE, Samuel Taylor, English poet and critic: b. Ottery Saint Mary, near Exeter, in Devonshire, England, 21 Oct. 1772; d. Highgate, London, 25 July 1834. It is customary to divide Coleridge's life into three periods, according to the prevailing interest of each; most of his poetry was written before the close of 1798; from that year till 1818 he was chiefly interested in criticism; and the last 16 years of his life were given mainly to metaphysical studies. As in the case of De Quincey, the first part of his life usually receives by far the more attention, and the interest of the last period resolves itself into an account of his writings.

He was the son of the Rev. John Coleridge, vicar of Ottery Saint Mary, a man inclined to mysticism and transcendentalism, but also a pretty successful school teacher, and his second wife, Anne Bowden, a competent woman of much common-sense. Coleridge, the youngest of 10 by this marriage, was the precocious one of the family and was regarded as a prodigy for his early attainments. His amusements were reading and dreaming and he early showed a marked liking for mysterious and spiritual things. In 1782, after schooling at his native place, he was sent to Christ's Hospital for eight years, where he was subjected to a rigorous intellectual discipline at the hands of the Rev. James Boyer, of whose methods he spoke with respect in 'Biographia Literaria.' At school he left a tradition, preserved by Lamb, of his intellectual and spiritual attainments. At Jesus College, Cambridge, which he entered in 1791 with a view to taking orders, he gained some distinction as a writer of Latin and Greek, read a great deal, particularly in the philosophers Berkeley and Hartley, and absorbed and advocated the doctrines of the French Revolution. This last brought him such notoriety that, in the fall of 1793, he ran away incognito to London, and enlisted in a company of dragoons, but weary of this experiment, obtained his release the following spring. The following summer he tramped about in England and Wales, made the acquaintance of Southey (q.v.), with whom he devised the "Pantisocracy" scheme for a social settlement on the banks of the Susquehanna, became engaged to Sarah Fricker, the sister of Southey's fiancée, and definitely terminated his university career. The year was an active and somewhat critical one. It was followed by his addresses on political subjects 'Conciones ad Populum, or Addresses to the People' (1795), which preached liberty, praised revolutionary doctrines and condemned government. By his marriage (1795), his editorial venture on the *Watchman* (March to May 1796), in which he tried to expound true opinions on such subjects as the principles of the French Revolution, Godwin's ideas and the like, and, more important, by his settlement in Nether Stowey, Somerset, in 1797, where he came in contact with Wordsworth, a new and important period in his literary life was ushered in.

The meeting with Wordsworth had important results in English literature, for it led, in 1798, to the publication of the 'Lyrical Ballads.' Coleridge's own contribution to this volume, designed by its authors to change poetical taste, was his masterpiece, 'The Ancient Mariner.' The year practically marks the end of his poetical production, though the famous 'Christabel' was not finished till two years later, and remained unpublished till 1816. Coleridge had previously written many poems; many of these were published in 1796 and 1797, under the title 'Poems on Various Subjects,' and he had also tried his hand at several dramas. Aside from the masterly 'Ancient Mariner,' 'Christabel' and 'Kubla Khan,' on which, together with a few others, his fame as a poet rests, the poems are chiefly interesting as showing the tenor of Coleridge's mind. In substance they are what is generally termed romantic, and are almost always treated with a view to expressing some underlying mystery. In style they might be called accumulative, in that they progress by the piling up of a great number of images, and in many respects they imitate the epithetical manner of Gray, but are less successful and less restrained. The great poems named are, of course, among the most original in the language. 1797-98 was the poet's golden year.

The middle period of Coleridge's life is marked by great desultoriness. It opened with much promise. After a journey to Germany (September 1798 to September 1799), in company with Wordsworth, he returned to England, where his first work was his brilliant translation of Schiller's 'Wallenstein,' usually regarded as one of the masterpieces of English translation. That same year and the following year he wrote a number of able articles for the *Morning Post* condemning, on the one hand, the policy of Pitt, and, with equal zeal for the cause of liberty, the aggressions of Bonaparte. The impulse was short-lived. Failing health and growing restlessness caused him to go to Malta in 1804. It is known that at this period he was taking opium; whether strictly for the alleviation of pain, or whether to opium was due the cause of his failing health, is not definitely known. He made the acquaintance of the drug nearly 10 years before and the severest of his critics, Mr. Robertson, maintains that all his most brilliant poems were written under its influence, but the whole matter is in some uncertainty, except for the fact that for a matter of 12 years he was, except at rare intervals, incapacitated from doing sustained work. From 1804 to 1816 he lived in great depression. A residence of two years and a half at Malta, where he was secretary to Governor Sir Alexander Ball, was of no benefit to his health, and on the whole he showed a weakening of purpose, as was natural to a man of weak will when removed from the guiding influence of friends. On his return his life was desultory and nomadic and he found himself in hard circumstances. Gradually becoming estranged from his friends and family, he finally separated from his wife, and in 1810 left the Lake region for good. From that year till 1816 he lived at Hammersmith, London, and at Calne, in Wiltshire, with an old friend, John Morgan, by whom he was treated with the utmost kindness. Early in 1816, however, the Morgans, owing to loss of property, were obliged to give up the task, and, moreover, Coleridge, to whom the six years had been the most futile of his life, felt obliged to take some more energetic measures to redeem himself. Accordingly, in April 1816, a home was found for him with Dr. Gillman, in Highgate, London, where his health might be watched with care and firmness, and here he remained the rest of his life.

Up to 1818, as has been said, Coleridge was chiefly interested in criticism, but his work was, naturally, of a desultory nature. His first public utterances, after the articles in the *Morning Post,* were a series of 18 lectures on 'Poetry and the Fine Arts,' delivered at the Royal Institution in London, from January to May 1808. He had previously projected a course of lectures on the same subject, but they had come to nothing. The lectures of 1808 were very poorly given and were unsuccessful; De Quincey has a vivid picture of the miserable figure that Coleridge presented as he faced his audience. Three courses in the winter of 1811-12, chiefly on Shakespeare and Milton, had a better fate, and, from accounts, must have made a great impression. These courses were recast into two which were badly delivered at Bristol in the winter of 1813-14. In 1818, Coleridge closed his career as a lecturer with a course on the history of literature, which added much to his reputation. These various talks were published for the first time in 1836, in Vols. I and II of Coleridge's 'Literary Remains.' In their present shape they are fragmentary; some are pretty complete, others merely marginal jottings, and others exist only in name.

Considered as a whole, these lectures attempted to define poetry, to trace in some detail the course of literature, to exalt to an unprecedented height the name and fame of Shakespeare and to give his readers material for a sound critical judgment. Concerning the last of these points he said, for example, in the course of 1818, that he desired "To convey, in a form best fitted to render them impressive at the time, and remembered afterwards, rules and principles of sound judgment, with a kind and degree of connected information such as the hearers cannot generally be supposed likely to form, collect, and arrange for themselves by their own unassisted studies,» and he added, «I hope to satisfy many an ingenious mind, seriously interested in its own development and cultivation, how moderate a number of volumes, if only they be judiciously chosen, will suffice for the attainment of every wise and desirable purpose; that is, in addition to those which he studies for specific and professional purposes.» Among the many great names which he chose to illustrate this oft-repeated idea, Shakespeare, in all the courses of lectures, occupied the chief place. His chief thesis, that Shakespeare is a poet of consummate poetical power and that his judgment is equal to his genius, he illustrated and illuminated with copious analysis and criticism, chiefly by running interpretation of the different plays and by pregnant statements of the fundamental differences in dramatic interest in the different types of play. Generally speaking his point of view is that of a man interested in works that express the soul, the reason and the imagination, rather than outward situation, intelligence, fancy or wit. More narrowly, it is the criticism of a man who gloried in the superiority of the literature of his own country, and of the moralist who abhorred the quality of the 'Decameron' and the misanthropy of Swift, and who praised the moral lessons of 'Robinson Crusoe' and 'Macbeth.' Nearly all his criticism in these lectures shows a love of fundamental distinctions, as, for example, the chivalric spirit of Spenser as compared with the universal, impersonal spirit of Shakespeare; or the distinctions between the witty, the droll, the odd, the humorous, etc., as illustrated by Rabelais, Swift, Sterne and others. This idea of drawing fundamental distinctions has had a great influence on succeeding criticism.

Even more characteristic of the Coleridge of this period was the series of essays called 'The Friend.' This he intended to issue in January 1809, but he characteristically put it off until the midsummer. Thence it ran till March 1810. He attempted to publish it himself as a weekly periodical from the Lake district, but his practical mismanagement was such that it rarely came out on time, and the scheme came to an end with the 27th number, long before he had reached his main point. The work was reissued in 1818 with additions. The plan of the periodical, as well as Coleridge's conduct of it, foredoomed it to failure. Without regard to the work of his predecessors in the essay field, he attempted to treat philosophical questions and inflicted them on his readers with little variety and much diffuseness. The volume as it stands to-day contains three main parts dealing respectively with the laws of right thinking for the individual as an individual, the principles of political knowledge and the «grounds of morals and religion and the discipline of the mind requisite for the understanding of the same.» These are separated by essays in a lighter vein entitled 'Landing Places.' In spite, however, of the total lack of adaptation of the subjects to the tastes of his readers and to the periodical form, and his own unbusinesslike ways, the book as it now stands is regarded as containing much of Coleridge's most stimulating work, his best flashes of insight, and is, in particular, replete with those famous distinctions, like that between reason and understanding, truth and veracity, which have proved stimulating to the spirits of succeeding generations. Much of its value lies in its point of view, which is that of an idealist who believes that motives are more important than results and that right thinking on all questions is better than action directed by mere prudence; and it lies also in his persuasive and winning style.

More important than 'The Friend,' indeed his most valuable work, is the 'Biographia Literaria.' This he projected and in a measure composed in 1815, but the happy results of his change to Gillman's home probably allow him to improve the form of the book for its publication in 1817. His specific purpose, characteristically enunciated after the book was well under way, was to give voice to miscellaneous reflections suggested by particular events, to state his views on politics, religion, philosophy, poetry and criticism, and to settle, on principle, the controversy that had grown up about the 'Lyrical Ballads.' On the philosophical side, the book amounts to a protest against materialist views of the origin of ideas, and it is notable for its digressions and distinctions, as that important one, which he borrowed largely from Schelling, between the objective facts of the world and a self-sustaining and self-regulating consciousness, independent and indestructible. The critical ideas, brought out most vigorously in his classic criticism of Wordsworth, are more important, and are among the most influential ever enunciated by any English critic. Abandoning the formalism of preceding English critics, and eschewing the oracular dogmatism of contemporary reviewers, such as Jeffrey, he rested his critical case on (1) a theory of poetry deduced, not from authority, but from philosophy, logic, psychology, and what he called «the nature of man»; (2) on the actual phenomena as presented by the actual vogue of an author, a complete, rather than a partial, view of an author's production, the purpose of the author as revealed in the interpretation of his meaning, and an analysis of the qualities of his style; and (3) in a wholly impressionistic way, on a feeling for what is good in poetry — which last, indeed, is really his ultimate test. So far as can be seen by a comparison with such earlier critics as Dryden, Addison and Johnson, he pushed to a further degree than his distinguished predecessors his dependence on a theory of art and on philosophy, his reliance on analysis of qualities and his personal feeling for what is good; and he is practically original among English critics up to his time in taking into account as necessary points of departure the vogue of an author and his purpose. He differs from such contemporary critics as Lamb and Hazlitt in not trusting, at least ostensibly, to feeling alone, and from De Quincey, in that the latter usually lays chief stress on what might be termed the intellectual contribution of an author. The more strictly autobiographical parts of 'Biographia Literaria' deal for the most part with Coleridge's intellectual experiences and the influences to which he was subject.

The remaining literary work of this period is of less importance. It comprises some desultory and comparatively colorless articles for the *Courier* in 1808 and 1811, chiefly against Bonaparte, the recasting and acting (1813) with some success of his drama 'Remorse' and the writing of the pastoral play 'Zapolya' (1817), 'The Statesman's Manual' (1816), a challenge to «all the critical benches of infidelity to point out any one important truth, any one efficient practical direction or warning, which did not pre-exist (and for the most part in a sounder, more intelligible, and more comprehensive form) in the Bible,» and «A lay sermon addressed to the higher and middle classes on the existing distresses and discontents» (1817), an earnest and eloquent appeal to his readers to live by reason and wisdom and to refer conduct to ultimate principles.

The last named titles anticipate the chief subject of the so-called last period of Coleridge's career — his interest in theology and metaphysics. His writings on those subjects are embraced in three chief titles — 'Aids to Reflection' (1825), 'On the Constitution of the Church and State' (1830) and the posthumous 'Confessions of an Enquiring Spirit' (1840, written between 1824 and 1834). Though these writings probably did more than any other of the author's to give him the great reputation which he had in the contemporary and succeeding generation, they add little to our knowledge of the great principles which dominated Coleridge's intellectual life. The 'Aids to Reflection,' his most important spiritual work, is a series of aphorisms designed to help the reader to think and feel rightly, that is, in an orthodox, Anglican way, on spiritual matters. In his own words, he aimed «to direct the reader's attention to the value and science of words — to establish the distinct characters of prudence, morality, and religion — to substantiate and set forth at large the momentous distinction between reason and understanding — to exhibit a full and consistent scheme of the Christian Dispensation, and more largely of all the peculiar doctrines of the Christian Faith.» His point of view is characteristically theoretical, introspective and mystical, rather than objective and historical, and his exposition is, as usual, fragmentary and unsystematic. 'On the Constitution of the Church and State,' a more regularly sustained thesis, contains much the same premises, and is a piece of special pleading, ostensibly designed to show the people of England how to think and vote rightly on the question of Catholic emancipation. It is substantially an argument in favor of the national Church. The 'Confessions' is one of the most striking expressions of a well-known doctrine of the 19th century that the Bible, the only sufficient rule of faith and practice, is nevertheless not to be taken literally but in what Arnold later called a literary way and Coleridge here called «according to reason.» The demonstration of its truth is internal, not dogmatic. To this period also belongs Coleridge's 'Table Talk,' published after his death from the notes made by H. N. Coleridge between 1822 and 1834, and containing a rich and varied array of observations, chiefly philosophic in character, from the most brilliant talker of the time.

Critics of Coleridge are pretty well united in calling him one of the great sources of intellectual stimulus of his generation. His supporters, like Mill, point out the fundamental fact of his vast influence in fecundating the mind of his contemporaries. His detractors, like J. M. Robertson, lay stress on his desultory habits of mind, his weakness of character and his vast plagiarism, «unparalleled in literary history.» The truth is probably that he so keenly and genuinely desired to find fundamental principles and sanctions for belief and action that he did not mind where he got his principles so long as they impressed him. Setting aside the question of his influence, his work (aside from his poetry) is, as it stands, remarkable for its avoidance of history in all its forms, of science as we know the term and for its confinement to the fields of philosophy, metaphysics, theology and criticism. In these fields it is almost wholly introspective, it consists of an examination of the contents of his mind and is noteworthy for an almost complete lack of sense for external fact. Within these limits, few writers have scattered broadcast so many stimulating ideas; his apothegms and pregnant sayings are enormous in number, as well as recurrent. Added to this is an acute logical sense for detecting flaws in the arguments of an opposing view, a feeling for axiomatic proof, and a style, which, though desultory and essentially a monologue, is often marked by grandeur and charm. See ANCIENT MARINER, THE; CHRISTABEL; KÛBLAI KHAN.

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WILLIAM T. BREWSTER,
Professor of English, Columbia University.

COLERIDGE, Stephen, English author and artist: b. 31 May 1854. He is a graduate of Trinity College, Cambridge. He has exhibited pictures at Birmingham, Leeds and elsewhere, is honorary secretary of the National Anti-vivisection Society, and has published 'Demetrius' (1887); 'The Sanctity of Confession' (1890); 'Gloria' (1903); 'Songs to Desideria' (1907); 'New Poems' (1911); 'Memories' (1913); 'A Morning in My Library' (1914).

COLERIDGE-TAYLOR, Samuel, British composer: b. 15 Aug. 1875; d. 1 Sept. 1912. His father was a native of Sierra Leone and his mother an Englishwoman. He studied music under Villiers Stanford, and set three sections of Longfellow's poem 'Hiawatha' as a cantata. Among other of his compositions was 'The Atonement,' and oratorio, and 'The Blind Girl of Castel-Caillé.'

COLES, Abraham, American prose writer and poet: b. Scotch Plains, N. J., 26 Dec. 1813; d. Monterey, Cal., 3 May 1891. In 1835 he was graduated from Jefferson Medical College, Philadelphia. He published 13 original translations of the celebrated hymn ‘Dies Iræ’ (1859); ‘Old Gems in New Settings’ (1866); ‘The Microcosm,’ and ‘The Light of the World’ (1884). He also made metrical versions of many of the psalms.

COLES, Edward, American political leader: b. Albemarle County, Va., 15 Dec. 1786; d. Philadelphia, Pa., 7 July 1868. He was graduated from William and Mary College in 1807. He was Madison's private secretary from 1810 to 1816, and in 1817 was sent on a diplomatic mission to Russia. Shortly after his return to the United States he removed to Illinois; while living in Virginia he had owned slaves, but took them with him and liberated them, and soon became prominently identified with the anti-slavery party in Illinois. In 1822 he was elected governor of the State, holding that office till 1826. During his administration an attempt was made to amend the State constitution in favor of slavery, but under his leadership the anti-slavery party carried on a vigorous campaign in opposition to the proposed amendment and decisively defeated it. After 1833 he lived in Philadelphia. Consult Washburne, ‘Sketch of Edward Coles.’

COLET, kŏl'ĕt, **John,** English divine, founder of Saint Paul's School, London: b. London 1466; d. there, 16 Sept. 1519. His father, Sir Henry Colet, was twice lord mayor of London. About 1493 he set out to make a continental tour, and became acquainted with several of the most eminent men of the time, among them Erasmus and Budæus. While on the Continent he studied Greek, canon and civil law and the writings of the fathers. In 1496 he returned to England, and in the following year he was ordained, took up his residence in Oxford and lectured in Latin on Saint Paul's Epistle to the Romans. He was an ardent advocate of the new learning and an admirable Bible scholar. Erasmus was one of his audience at a later series of lectures on the First Epistle to the Corinthians, and from this time (1498) the two became warm personal friends. In 1505 Colet was appointed dean of Saint Paul's. With Sir Thomas More and others he urgently advocated the reform of certain ecclesiastical abuses, but it is a mistake to suppose that he held anything in common with the spirit of the Protestant Reformation for which his work helped to a very considerable degree to pave the way. Saint Paul's School was founded and endowed by him in 1512, the earliest school in England in which Greek was a regular part of the curriculum. His writings are not numerous, but give good evidence of his learning and piety. In 1867–76 J. H. Lupton produced an edition of those of Colet's works not published during the 16th and 17th centuries. The most recent biography is that by Lupton, J. H. (1887 and 1909); Seebohm, F., ‘Three Oxford Reformers: Erasmus, Colet and More’ (London 1887).

COLET, kō-lā, **Louise Révoil,** French poet and novelist: b. Aix, France, 15 Sept. 1810; d. Paris, 8 March 1876. She was the wife of Hippolyte Colet, a noted musical composer and professor in the Conservatory (1809–51). She went to Paris with him in 1835 and the following year she published her first book of poems, ‘Fleurs du Midi.’ She was a very beautiful woman, passionate in her expression of thought, and gifted with wonderful faculties of expression and depth of feeling. Her salon became one of the noted literary centres of Paris. She went the way of her day and her liaisons with noted men became notorious. Four times, 1839, 1843, 1852 and 1855, poems of hers were crowned by the French Academy. She was a graceful lyrist and often struck the chord of deep passion with effect. Of her verses, poured forth with marvelous facility, ‘The Woman's Poem’ is perhaps her best after the four offered to the Academy. Among her other poetical works are ‘Poésies’ (1842); ‘Ce qui est dans le cœur des femmes’ (1852); ‘Les convictions’ (1853); ‘Les satires du siècle’ (1854); and among her best known prose works are ‘La jeunesse de Mirabeau’ (1841); ‘Les cœurs brisés’ (1843); ‘Deux mois d'émotion’ (1843); ‘Folles et Saintes’ (1844); ‘Madame du Châtelet’ (1854); ‘Naples sous Garibaldi’ (1861); ‘Histoire d'un soldat,’ one of her best stories. Her dramatic pieces include ‘La Jeunesse de Goethe’ (1839); ‘Julius Cæsar,’ and ‘Charlotte Corday.’

COLEY, William Bradley, American surgeon: b. Westport, Conn., 12 Jan. 1862. He was graduated at Yale in 1884 and at Harvard Medical School in 1888. He has been in practice as physician since 1888, is attending surgeon at the General Memorial Hospital and the Hospital for Ruptured and Crippled, and also professor of clinical surgery at the Cornell University Medical School. He is author of the article on «Cancer» in ‘Twentieth Century Practice of Medicine’ (1897); article on «Hernia» in Dennis' ‘System of Surgery’ (1896); in Warren and Gould's ‘International Textbook of Surgery’ (1898); in ‘Progressive Medicine’ since 1898, and in Keene's ‘Surgery’ (1907).

COLFAX, Schuyler, American statesman: b. New York, 23 March 1823; d. Mankato, Minn., 13 Jan. 1885. He removed in 1836 to Indiana, where in 1845 he acquired a newspaper at South Bend, which he made the most influential Whig journal in the district. He was a delegate to the Whig conventions of 1848 and 1852; was elected to Congress in 1854 by the newly formed Republican party and re-elected until 1869, being thrice chosen speaker; and in 1868 he was elected Vice-President of the United States, in Grant's first term. Implicated, unjustly, as he and his friends claimed, in the Crédit Mobilier charges of 1873, he spent the remainder of his life in political retirement, making public appearances only on the lecture platform. He was the founder of the Daughters of Rebekah branch of American Odd Fellowship.

COLFAX, Iowa, city in Jasper County, 22 miles east of Des Moines, on the Chicago, Rock Island and Pacific Railroad. The city has noted mineral springs and a public library. Coal mining and the bottling of spring water are the chief industries. The waterworks are municipally owned. Pop. 2,524.

COLFAX, Wash., city, county-seat of Whitman County. It is situated on the Palouse River, the line of the Oregon Railroad and Navigation Company, and 80 miles south of Spokane. It is a trade centre for the products of the fertile, surrounding country; grains, lumber, fruits and live stock are the chief exports. Manufactures are increasing. The waterworks are owned by the city. It contains a hospital and fine courthouse. Pop. 2,783.

COLGATE, Austen, American manufacturer: b. Orange, N. J., 12 Aug. 1863. He was graduated at Yale University in 1886. Immediately afterward he entered the firm of Colgate and Company; in 1896 was admitted to partnership, and became vice-president of the company on its incorporation. He took a great interest in political events, gained a place in the councils of the Republican party, and has taken part in all important campaigns of recent years. In 1906 he was elected member of the New Jersey assembly and served in 1906–08 and 1909. Governor Fort appointed him chief of staff and his personal aide. He was also made Deputy Adjutant-General of the New Jersey National Guard, with the rank of colonel. In 1911 he was elected to the New Jersey senate, and was re-elected in 1914.

COLGATE, James Boorman, American financier and philanthropist: b. New York, 4 March 1818; d. Yonkers, N. Y., 7 Feb. 1904. He was for some years a member of the dry goods firm of Colgate & Abbe in New York, and in 1852 formed a partnership with J. B. Trevor as dealers in stocks and securities. To Colgate University (q.v.) he gave several buildings and an endowment of $1,000,000 called the Dodge Memorial Fund, and also gave to other institutions. For several years he was president of the New York Gold Exchange, of which he was one of the founders.

COLGATE, Samuel, American manufacturer, brother of James B. Colgate (q.v.): b. New York, 22 March 1822; d. Orange, N. J., 23 April 1897. He was a son of William Colgate, founder of the soap and perfumery house of Colgate & Company. Samuel Colgate succeeded his father as head of the firm, and continued his father's generous benefactions to religious, educational and charitable enterprises. With his brother he erected Colgate Academy building in Hamilton, N. Y., at a cost of $60,000, and in recognition of their gifts to Madison University, in the same place, the name of that institution was changed to Colgate University (q.v.). He bequeathed to Colgate University a collection of Baptist reports and literature, numbering 40,000 titles, in several languages, made during the many years he was president of the New York Baptist Education Society.

COLGATE, William, American manufacturer: b. Kent, England, 25 Jan. 1783; d. New York, 25 March 1857. He came to America in 1795 and to New York in 1804, and became apprentice to a soap-boiler. In 1806 he established himself as soapmaker at 6 Dutch street, New York, and for half a century followed this business with an intelligence and industry that commanded the largest success. He was one of the leading members of the Baptist denomination in New York and was distinguished for his zeal and liberality in all its missionary and educational enterprises.

COLGATE UNIVERSITY, an educational institution at Hamilton, N. Y., founded 1819 by the Baptist Education Society of the State of New York. The early name of the institution was the Hamilton Literary and Theological Institution. It was changed to Madison University in 1846. In 1890 the name was again changed to Colgate University. The university consists of two distinct institutions, a college and a theological seminary under the same corporate management. The theological courses of three years lead to the degrees of Bachelor of Divinity and Master of Arts. The college offers courses leading to the degrees of Bachelor of Arts and Bachelor of Science, provision being made for graduate work for the corresponding master's degrees. The campus of the University comprises 220 acres, on which are 15 university buildings. The faculty numbers 50 and the students 600. There are 75,000 volumes in the library. Endowment of the University is about $2,500,000; value of grounds and buildings about $1,000,000.

COLIC, in pathology, a painful affection of the intestines, especially of the large bowel or colon, whence the name. The pain is due to spasmodic and irregular contractions of the colon, and is felt chiefly in the region of the navel. It is of a severe twisting character, and comes on in paroxysms, occasionally so severe that the patient rolls and twists about, usually doubled up and grasping his abdomen, and not seldom groaning or crying. Constipation of the bowels usually accompanies colic, and the pain may give rise to vomiting. Often, however, severe colicky pains are the forerunner of looseness of the bowels, caused by some food which has disagreed. The pain may be caused by wind, the discharge of which affords great relief. There is no fever with the attack, but the pulse is usually lowered, and the face pale and anxious-looking. In this respect colic differs from inflammatory attacks of the bowels. Pressure on the abdomen generally gives relief in cases of colic, but in cases of inflammation the patient cannot endure pressure. Whether the attack be one of colic or not may readily be learned from the attitude of the sufferer and the fact of his exerting or avoiding pressure. Treatment consists in applying hot cloths or bags of hot salt across the abdomen. Doses of medicine, such as castor-oil, should also be administered, and a large injection of water at a gentle warmth will probably bring relief. In the case of an adult patient 30 drops of laudanum may be given along with the castor-oil, or shortly after it. Magnesia and dill-water are also used as remedies for colic in young children. What is called biliary or renal colic is caused by the passage of gall-stones or kidney stones toward the bowel or bladder respectively. It occurs oftener in women than in men.

COLIGNY, kō-lēn-yē, **Gaspard de,** French soldier: b. Châtillon-sur-Loing, 16 Feb. 1517; d. Paris, 24 Aug. 1572. After a brilliant military career he was made in 1552 admiral of France. He was distinguished for valor in battle, for strict discipline and for his conquests over the Spaniards, in particular for his defense of Saint Quentin. When Saint Quentin was taken by storm, the admiral was made prisoner. After the death of Henry II, the intrigues of Catharine de Medici induced him to place himself at the head of the Calvinists against the Guises. He formed so powerful a party that the Catholic religion in France seemed to be in danger. Condé was more ambitious, enterprising, active; Coligny more considerate, prudent and more fit to be the leader of a party; equally unfortunate in war with Condé, but skilled in remedying even what appeared irretrievable losses, he was more to be feared after a defeat than his enemies after a victory. The first battle between the Huguenots and Catholics (1562, at Dreux) was lost to the admiral, but he saved his army. When the Duke of Guise was murdered at the siege of Orleans, he was accused of being author of the murder. The civil war recommenced with increased fury in 1567. Coligny and Condé encountered the Constable Montmorency at Saint Denis. This indecisive action was followed by the battle of Jarnac in 1569, which was fatal to the Calvinists. Condé fell and the whole burden of command devolved on Coligny. An advantageous peace seemingly put a stop to this contest in 1570. Coligny appeared at court, and was, with his adherents, loaded with favors. Charles IX gave him 100,000 francs as an indemnification for his injuries, together with a seat in the council. From all sides he was warned not to trust to these caresses. As the admiral was leaving the Louvre, 22 Aug. 1572, his right hand and left arm were wounded by a shot from a window. One Maurenal had fired at him from a building belonging to the monastery of Saint Germain l'Auxerrois, according to the plan of Catharine de Medici, probably with the knowledge of the Duke of Guise. Charles testified the deepest sorrow, caused search to be made for the assassin and said to Coligny, «My father, you have the wounds, but I the pain.» This he said at the moment when the massacre of the Protestants was already prepared. The slaughter began on the night of Saint Bartholomew's, 24 Aug. 1572. The Duke of Guise hastened with a numerous suite to the house of the admiral. One Behme, or Besme, entered with his drawn sword into the chamber of the old man, pierced him with several stabs and threw the body out of the window into the courtyard. See CONDE, LOUIS I DE BOURBON.

COLIIDÆ. See MOUSEBIRD.

COLIMA, kō-lē'mä, Mexico, state in the southwest of the United States of Mexico. It includes the four desert islands, Socorro, Rosa Partida, San Benedicto and Clarion, which form the Revillagigedo group. The northern section of the state is occupied by the slopes of the Colima volcanoes. The Armeria River flows through the state, and the Coahuayama is on the boundary. There are two lakes, Cuyuthan and Alcuzague. The climate, except in the mountainous region, is hot and unhealthful. Rainfall is abundant and malaria prevails. Salt, silver, gold, sulphur and copper are found; about 170 species of trees, including fruit, and trees, the parts of which are useful for tanning, dyeing, clothing, food and medicine. The chief products are coffee, cacao, tobacco, rice, cotton, indigo, sugarcane, cereal and leguminous plants. The principal industries are agriculture, stock-raising and working in the salt sections. Much of the trade is with the other states of Mexico, especially those along the coast, but it has a growing trade with Germany, Hawaii and the United States cities on the Pacific. Exports are rice, coffee, rubber, fruits, cabinet and dye woods, corn, hides and skins and minerals. Imports are woolen, linen and silk goods, foodstuffs, wines and liquors, glassware, firearms and ammunition. The Pacific Mail, Red Line, Izaquirre and the Sinaloa and Durango Railway Company's steamers connect the port of Manzanillo with other ports, foreign and domestic.

COLIMA, Mexico, capital of the state of Colima. It is situated in a fertile valley, which is irrigated by the Colima River. It is generally well built and has fine plazas and a number of pretentious buildings, among which are the government building, the San Juan Hospital, the city hall, cathedral, theatre, the station of the Mexican Northern Railroad and a new market. It has an electric-lighting system, a street-car line, etc. The town has connections by rail and water with the port, Manzanillo, and is the seat of considerable trade. Colima was founded in 1523 by Gonzalo de Sandoval. About 40 miles to the northeast of the town is the volcano of Colima, nearly 13,000 feet high, which is constantly in a state of eruption. Pop. 25,148.

COLIN, Jean Lambert Alphonse, French general and military historian: b. 1864; d. 1 Jan. 1918. Educated for the army, he entered the artillery and had attained the rank of captain when, in 1898, he published 'Etudes sur la Campagne de 1796-97 en Italic.' This anonymous essay on Napoleon's first campaign immediately attracted the attention of military historians and critics by its masterly style of narration, exactitude and criticism. The work became a classic and at once superseded all previously-written accounts of that campaign. Captain Colin was soon attached to the historical section of the French general staff and for several years a number of important works by him were published. 'The Military Education of Napoleon' (1900) threw the first clear and full light on Napoleon's early studies and on the sources of his theory and practice in war. This was followed by a series of brilliant histories, 'Les Campagnes du Maréchal de Saxe'; 'Louis XV et les Jacobites'; 'Projets de Debarquement en Angleterre;' and 'La Campagne de 1805 en Allemagne,' which is regarded as the standard work on the campaign of Ulm and Austerlitz. Colin meanwhile also published monographs on 'Hannibal in Gaul' (1904); 'Tactics and Discipline in the Armies of the Revolution' (1902); and 'L'Infanterie au XVIII^e siècle La Tactique,' a review of the progress of tactics from Marlborough to Napoleon. In 1911 he published 'Les Transformations de la Guerre,' which appeared in an English translation under the title of 'France and the next War' (London 1914). 'Les Grandes Battailles de l'Histoire' (1914) aimed at showing how the procedure of great military leaders is fundamentally always the same. His last work was a volume on Napoleon in the series 'Les Grands Hommes de Guerre,' a concise account of Napoleon's wars and battles. Colin at times had thoughts of leaving the army and devoting himself entirely to literature. He had planned a series of volumes on military history intended for popular reading. At the outbreak of the war General Joffre employed him on the general staff of the army. He commanded the artillery of a large division at the Marne and that of an army corps at Verdun. In 1916 he was sent to Macedonia as brigade-general and there commanded a brigade of artillery at the side of a British heavy battery. He was in command of an infantry division when he received his death wounds. It is said that no European officer of our time equalled Colin in his mastery of the strategy and tactics of the great commanders.

COLIN CLOUT, a satire by John Skelton. It was a vigorous pre-Reformation protest against the clergy's lack of learning and piety. Edmund Spenser adopted "Colin Clout" as his *nom-de-plume*. Colin Clout is also the name of a shepherd in 'The Shepherd's Week,' a pastoral poem by Gay.

COLISEUM, more properly **COLOSSEUM,** a gigantic ruin in Rome, the greatest amphitheatre which Roman magnificence ever erected. It was commenced by Vespasian (reigned 69–79 A.D.), and practically finished by Titus about the year 80 A.D., who dedicated it with shows in which 5,000 animals were killed. It was built to furnish a place for amusements for the Roman people; such as gladiatorial combats, fights with wild beasts and less harmless athletic sports. In the early days of Christianity it was the scene of the martyrdom of a number of Christians. It is said to have held 100,000 spectators, of whom about 87,000 were seated. For the greater part it consists of travertine, is elliptical in shape, 1,680 feet in circumference and 157 feet high, and has three rows of columns, one above the other: the lowest is of the Doric, the second the Ionic and the hightest the Corinthian order. The diameter of the arena from side to side was 182 feet, from end to end 285 feet. Down to the 6th century this monument of ancient grandeur remained almost uninjured, when Theodoric, king of the Goths, caused material to be taken from it for the construction of various buildings; afterward Pope Paul II took all the stones from it, which were used for the construction of the palace of Saint Mark, and in later times some other palaces were erected from its fragments.

COLLAR-BONE. See CLAVICLE.

COLLARD, Charles François Thomas, Belgian sociologist and author: b. Louvain, 22 Oct. 1882. He was educated at the Collège Saint Pierre, Louvain, and at the universities of Louvain, Berlin, Bonn and Zürich. He studied law, became a deputy justice of the peace and deputy royal prosecutor at Louvain and later deputy royal prosecutor at Brussels. He traveled in Germany, Holland, Italy and Switzerland and was secretary to the Congress of Administrative Sciences at Brussels in 1910. He also served as recorder or secretary to the Congress of the International Union of Penal Law at Brussels 1910; the International Congress of Children's Courts at Paris 1911, and the Congress for the Protection of Former Convicts and Wayward Children, Antwerp 1911. He is a member of the International Union of Penal Law, the Society of Political Economy of Brussels and the General Society of Prisons of France. He has published 'L'Education protectrice de l'enfance en Prusse' (1908); 'Les tribunaux spéciaux pour enfants' (1911); 'L'Institution et l'organization des tribunaux speciaux pour enfants' (1911); 'Notice et traduction de la loi du 13 Juillet, 1907, sur le contrat de travail en Hollande' (1908). He is a member of the editorial staff of *Revue de droit pénal et de criminologie*, and has contributed articles on sociology and economics to 'The Catholic Encyclopedia,' *La Réforme Sociale, Revue sociale Catholique, Revue pratique de droit industriel, Jugendwohlfahrt,* etc.

COLLARED LIZARD, one of the iguanid lizards of the genus *Crotaphytus*. Its habitat is in the open country of the southwestern United States from the Ozark Mountains to California. The name is derived from the double black collar around the neck of the species *Crotaphytus collaris*. This species is entirely insectivorous, can run rapidly and often on its hind legs alone. Another well-known species is the leopard lizard (*Crotaphytus wislizenii*), which is noted for its fierce disposition. It feeds on leaves, insects, young horned toads and smaller lizards even of its own species. In the breeding season both male and female undergo a change of color. Consult Ditmars, 'The Reptile Book' (New York 1907).

COLLARS AND CUFFS, Manufacture of. The collar trade, a distinct and important branch of the "gent's furnishing" industry, originated at Troy, N. Y., about 1825, when the wife of a blacksmith conceived the idea of making the first detachable collar. Prior to that time shirts had always been made with the collars and cuffs attached to them. The detachable collar soon became extremely popular, and, in 1829, Rev. Ebenezer Brown, who had retired from the Methodist ministry to establish a dry goods store in Troy, opened a small collar factory.

As this branch of Mr. Brown's business increased very rapidly it was not long before he had several imitators. Somewhat prior to 1834 Montague & Granger erected a still larger factory and devoted it to this industry. About a year later Independence Stark began to make collars in quantities, and, about 1837, he opened an establishment for the laundering of collars, both his own and other manufacturer's make. This was the first "Troy Laundry," a name which is now known from one end of the land to the other. In these days, collars were known as "String Collars," because they were then tied around the neck by means of a string attached to each end. They were worn with the old-fashioned stock tie.

The manufacture of detachable cuffs began in 1845. When in 1851 Nathaniel Wheeler, of the firm of Wheeler & Wilson, attempted to introduce his new sewing machine into the collar and cuff business, the makers laughed at him for his presumption in declaring that his invention would enable them to produce as good collars and cuffs at a cheaper cost than any human agency could sew them. Among all the Troy manufacturers only one, Jefferson Gardner, was willing to give the machine a trial. His experience was so satisfactory that within 12 months the other factories were supplied with similar machines, and one of the manufacturers, W. O. Edson, of the firm of Bennett & Edson, was operating them by means of steam power.

The second great invention to which the amazing growth of the collar and cuff industry is so largely due was the introduction of the button-hole sewing machine, in 1875.

A single collar will often pass through 25 different operations, each of which requires the attention of an expert in his particular line of the trade. The designing of patterns is also expert work and there are sometimes many patterns for a single collar, each ply being cut to a different measure.

It is an extremely difficult matter to secure anything like reliable statistics relating to the collar and cuff industry, because, as an industry, it is of such recent origin that it was not honored with a separate classification in any United State census report prior to that of 1900. Moreover, as the making of collars and cuffs is carried on conjointly with the making of shirts by many of the big manufacturers, it is not easy to make a satisfactory arrangement of such data as may be obtainable. Of the statistics published, however, those of the census bureau have met with the most favorable reception.

According to these figures, the total value of the collar and cuff product of the United States for the year ending June 1910 was $17,230,450. In the last census year no less than 22,000,000 dozen collars and cuffs were made in the United States, of which more than 17,000,000 dozen were made in Troy, while of the 12,421 workmen who depended upon this industry for their support, those who resided in Troy received over $4,000,000 in wages out of the total amount of wages paid in this industry in the United States, $4,912,316. The importance of the industry to the city of Troy is further indicated by the fact that, according to the same census reports, the collar and cuff factories located there represent more than 31 per cent of the combined industrial interests of the city.

COLLATION. (1) In the canon law of the Anglican Church, the act of a bishop in appointing a clergyman to a benefice (whether rectory, vicarage, canonry or prebend) when the living is in his own gift through lapse or otherwise. In such a case the combination of the act of presentation and admission or institution constitutes collation. In the Roman Catholic Church the word has much the same meaning when applied to the conferring of a benefice, except that some benefices are conferred by the bishop or some delegated ecclesiastic; others, and in a few cases only, by special grant of the Pope, a king or an abbess. In several countries of Europe the right of conferring the higher ecclesiastical dignities is regulated by a concordat between the Holy See and the respective governments. In English civil law collation means the bringing together of all the assets of an estate into a common fund for distribution among the heirs or next of kin. In England it is commonly known as hotchpot. Neither term is in common use in the United States.

(2) Collation, the name given to the restricted meal, sometimes permitted on fast days, usually food to the amount of about eight ounces or one-fourth of an ordinary meal.

COLLECT (*Collecta*) in ecclesiastical language means a collection, as of alms, taken up during the church service; this is of apostolic origin, and Saint Paul mentions the collections for the saints taken up on the first day of the week. Used in still another meaning it signified what collect still does in English, a brief prayer pronounced by the priest in celebrating mass after the Gloria.

COLLECTIVISM, a plan of social organization in which the means of production and distribution in a community would belong to the people collectively. The term is also applied to the theory that society should be so organized. In the collectivist commonwealth the people co-operatively organized would have full control of production and distribution. Collectivism does not involve the abolition of all private property, but only of private property in the means of production. Collectivism is considered by Socialists as the natural successor to the present social system, and is the form of organization which they seek to establish; hence the term collectivism is often used as synonymous with Socialism (q.v.).

COLLECTOR OF THE PORT. See CUSTOMS.

COLLEEN BAWN, kŏl'ēn bân, **The,** a noted play by Dion Boucicault. It was based on Gerald Griffin's novel 'The Collegians' (1828) and was first played 10 Sept. 1860. The novel was republished in 1861 as 'Colleen Bawn or the Collegian's Wife.'

COLLEGE (Latin, *collegium*), in its primary sense, a body of colleagues, a corporation or society of persons invested with certain powers and rights, performing certain duties or engaged in some common employment. In Great Britain and America some societies of physicians are called colleges. So, also, there are colleges of surgeons, a college of heralds, etc. Colleges of these kinds are usually incorporated or established by the supreme power of the state. The most familiar application of the term college in English is to a society of persons engaged in the pursuits of literature or science, including both professors and students. At first the students of the universities had no common bond of union, except that of study and discipline, and were lodged where they could find it convenient. Then hostels or boarding-houses were provided (principally by the religious orders, for the benefit of those of their own fraternity), in which the scholars lived under a certain superintendence. Charitable persons subsequently endowed these hostels that poor scholars might have free lodgings. The colleges of Oxford and Cambridge are academical institutions of this kind, each endowed with revenues of its own, and having fellows, students and tutors, who live together under a head, in particular buildings. Each college is regulated by laws framed by its founder, with such modifications as have been deemed necessary to introduce from time to time. According to these laws, the head (variously styled master, principal, warden, rector, etc.), is either chosen by the fellows from their own number, or appointed by the Crown or other authority. The fellows are graduates who receive special emoluments for a term of years, and are generally elected to the position on account of special scholarship; while the scholars, admitted as undergraduates, are either chosen from particular localities, schools, etc., or elected according to merit after free competition. There are also a number of ordinary students, all as a rule occupying chambers belonging to the college. The undergraduates receive their instruction chiefly from tutors, who are generally resident fellows. The colleges are subordinate to the university, and it is the university that confers degrees, and institutes and carries out the necessary examinations. Generally speaking, the term college implies an institution inferior to a university, so far at least as the right of conferring degrees is concerned; but in Scotland, Ireland, Germany and elsewhere there are no colleges such as those of Oxford and Cambridge, and the college or colleges in Scotland and Ireland are simply edifices in which the teaching is carried on. Some modern colleges are called university colleges, either because equipped similarly to a university, or because connected with a university, and able to train students for degrees to be obtained from that university. Institutions for teaching theology are often called colleges, and some schools that train pupils for the universities, or give a good secondary education, are also so called. In American usage college commonly indicates the stage of instruction intermediate between the high school and the university.

In France there are university colleges or *facultés* in all large towns, besides *lycées*, corresponding to what are called, in Germany, *gymnasia*. Other institutions of a similar kind, that is, schools for secondary education, are called *collèges communaux*. These are public establishments aided by the communes, and subject to the direction of the public authorities. Besides these, there is the *Collège de France*, which deserves the name of a university. It was instituted in 1529 by Francis I, and here numerous professors, among whom there are always some of the most distinguished men, lecture publicly and gratuitously. See AMERICAN COLLEGE; AMERICAN UNIVERSITY; CAMBRIDGE, UNIVERSITY OF; and articles on different colleges and universities.

COLLEGE, The American. See AMERICAN COLLEGE, THE.

COLLEGE OF THE CITY OF NEW YORK, The, originally entitled the Free Academy, was established in 1848 by the Board of Education of New York city. In 1854 the legislature of the State passed a law endowing the institution with collegiate powers and privileges; and in 1866 the name was changed to that of "The College of the City of New York." The college is supported by the city and is open only to residents of the city, to whom instruction and the use of textbooks and apparatus are entirely free. It thus stands in the same relation to the city as the American State university to the State, being the uppermost member in the scheme of public instruction. About two-thirds of its students are drawn from the high schools of New York, and the remainder from the preparatory department of the college itself and from private schools. The requirements for admission and for the degree are those of the ordinary American college. The degrees conferred are Bachelor of Arts and Bachelor of Science only, *i.e.*, the college has no professional schools and no graduate department. None but male students are admitted to the regular courses of the college, although its extension courses are open to all public school teachers of the city, whether male or female. From the time of its foundation to the year 1907 the institution was located at the corner of Lexington avenue and 23d street. In 1907 it removed to new buildings which had been erected for its use on the crest of Washington Heights and which form, by virtue of their commanding position and their architectural beauty, one of the most dignified and splendid ornaments of the city. The number of students in attendance in October 1917 was 9,439, distributed as follows: Regular students (candidates for the bachelor's degree), day session, 1,623 and evening session, 791; in extension courses, 4,875; extra-mural courses (given in the Municipal Building to employees of the city) 250; preparatory department, 1,900.

COLLEGE DRAMATICS. The co-operation of the arts of the theatre with the arts and aims of pedagogy — an alliance which has the profoundest roots — may be summed up in a few words. Most religious and worshipful in its origin, the primitive theatre becomes, in some sort, a moving picture aid to the teacher in his character of mystic; then, because his public craves yet more reality, history repeatedly gives us the view of the teacher-actor-dramatist evolving into the instructor of ethics (as distinct from mysticism), in a theatre within the Church itself, or within the School. At this point both Church and School conserve; while the secular dramatists and actors, taking the general public with them into a freer and often richer air of art, round out the humanities. Yet, observing that conservative educationists in all ages have been inclined to frown upon the theatre either as a frivolous amusement or a dangerous one, nevertheless in some form or another, high or base according to the times, toleration or lack of it, the mind of energetic youth has quite as stubbornly inclined to theatrical performances. And youth has ever prevailed. Thus we must constantly view the union of the academy and the theatre from two standpoints: first, the pedagogic, and then the distinctly theatrical. Oftentimes, as in ancient Greece, recitative or oratorical exercises have taken the place of a fuller expression of the dramatic instinct, but only as alternatives and palliatives. The plays of Æschylus, Sophocles and Euripides were used in the schools; and Plato in 'The Republic' refers to their influence. It is noteworthy that even he objected, on moral grounds, to the use of such masterpieces. But, of course, Time is not with Plato in this respect.

The Roman schools used plays as textbooks, and probably gave performances. Down the Middle Ages, the dramatic records are few and negligible. We have no evidence of a school theatre during this period till the 10th century, when Hrotsvitha, the Benedictine abbess in Saxony, wrote comedies after the manner of Terence, understood to have been performed in her convent school. But till the latter part of the 16th century plays and playing were mainly encouraged in the universities of western Europe for the purpose of Latin teaching. Even in this we see the beginnings of a development. Old form plays paved the way for the Neo-Latin plays of the schoolmen, until the Reformation made itself felt. At this day we have a survival in the Latin play of the Westminster School. Then, Latin falling out of general use, school plays came to be written in the vernacular. Italy, Holland, France, Germany and England were all exponents of school and university drama. Dutch scholars (led by Erasmus) gave the drama what was perhaps the warmest welcome in the schools. France introduced Ravinius Textor, who, through the school drama, is said to have been the first Continental playwright to influence the English stage. At this period also the university introduced George Buchanan, the sturdy Scottish humorist, who was compelled to flee from Scotland, where he wrote histories, to France, where he made plays. His 'Jephthes' was «the first classical tragedy written north of the Alps.» Montaigne played in Buchanan's school theatre, and writes his love and praise of his master in Essay I — 215 (Hazlitt edition). German school drama, more religious and probably more spectacular than that of other countries, became widely popular with the people. Schmidt tells us that the aim of the school drama was «to gain a mastery of the Latin language, to develop the pupil's oratorical powers, to picture vividly moral truths, to interest the pupils, parents and townspeople, to help pay the teacher's salary and sometimes to develop a knowledge and love of the dramatic arts.»

Many illustrious youths took part in these plays all over western Europe. In England, Oliver Cromwell, according to his biographer, Heath, played Tactus, the sense of feeling, in a school drama on the Five Senses. Francis Bacon was a famous dramaturg of «showes» at school and of masques at court; whence, doubtless, he drew the matter for his essay on 'Masques and Triumphs.' Since then many a college man, pleading with cold authority, has leaned heavily on the words of his incomparable Elizabethan prototype: «In modern states play-acting is esteemed but a toy, except when it is too satirical and biting; but among the ancients it was used as a means of educating men's minds to virtue.» And, again, of school drama: «It is a thing indeed, if practised professionally, of low repute; but if it be made a part of discipline, it is of excellent use. I mean stage playing; an art which strengthens the memory, regulates the tone and effect of the voice and pronunciation, teaches a decent carriage of the countenance and gesture, gives not a little assurance, and accustoms young men to bear being looked at.» Not the least use of the school and university playing in the vernacular in England was the contribution it made to the rise of the modern drama through the influence of classic translations and imitations. Thus even Euripides speaks indirectly to us to-day through the frigid Seneca, through the pre-Shakespearean dramatists, by Shakespeare himself. For this, a debt is due to the schools and universities. Again, the first English comedy, 'Roister Doister,' was a free adaptation from Plautus by Nicholas Udall, sometime master of Eton and of Westminster, whose work rose and developed in the schools. It was originally performed at Eton by the scholars. Consult A. W. Ward's 'History of English Dramatic Literature'; Boas's 'University Drama'; and the same author's 'University Plays' ('Cambridge History of English Literature,' Vol. VI); E. K. Chamber's 'The Mediæval Stage.'

Toward the end of the 17th century the academic drama passed out almost completely, although since that time occasional attempts have been made to revive the old spirit. These, however, have represented a tradition rather than any native genius.

During the later and less virile period of school drama, when there was little joy in either the school or its drama, some amazing textbook compendiums in dialogue form passed into academic currency as plays. The 16th century, for example, contributes Rastell's 'Interlude of the Nature of the Four Elements'; the 17th, Samuel Shaw's 'Dramatized Rhetoric'; the 18th, a 'History of England,' by John Holmes, for the performance of his 'Gentlemen of the Public Grammar School at Holt in Norfolk.' The least formidable of such works was the 'Scholo Ludus, or Gate of Tongues Unlocked,' by John Amos Comenius. No English edition of the book is known, which is not to be regretted, for even this, the top of all these pseudo-plays, is of a most forbidding texture in the original. But Comenius was a theorist with an open vision for all that; and, with Daniel G. Morhof of those times, another worthy reformer, a staunch believer that «schooling can be advanced by the acting of plays.»

In the 19th century, the neglect of the theatre by the universities opened the door to the wildest burlesques and other vagaries by the students themselves; these impertinences being ignored by dignity while, to the shame of scholarship, the serious theatre was stubbornly opposed by prejudice. The experience of Oxford and of Harvard amateurs will serve to illustrate the state of the university world during this period. For the amusing details of these and other similar bodies — details that often have an earnest purpose behind them — consult 'The Oxford Amateurs'; the Harvard 'Hasty Pudding Club Theatricals'; the pamphlet on 'The Fight for the Drama at Oxford'; the entertaining article on the 'Men Who Took Female Parts in Oxford [and Cambridge] University Plays'; 'Rise and Development of [American] College Musical Comedies'; 'College Folk' [American], and other articles and books listed below. It is interesting to note that The Hasty Pudding Club is the oldest dramatic organization in the United States, having been established in 1795. Now, in these early years of the 20th century, the world-wide Renaissance of the living drama has again touched the academies and a new chapter of much promise begins.

The first of the schools of England to revive interest in the ancient drama was Bradfield College under Dr. Gray, a modern among educationists, who for 30 years as warden and headmaster has proved a valiant foe of dry-as-dust methods. Bradfield is as famous in England for its miniature Greek theatre, embowered among trees in a shady green hollow, as the University of California is in the United States for its fine theatre at Berkeley; and the performances at each are of equal note. Many other schools in England are following in spirit the lead of the distinguished classical scholar of Bradfield (consult his article in the English *Review of Reviews,* listed below); and the movement is spreading over the whole English-speaking world. The first production of a Greek play in the United States was given by Harvard students in 1882. A full account has been written by one of the participants, Mr. Henry Norman, and illustrated by 15 excellent plates (Boston 1882).

At Harvard, Yale, the University of California, at Stanford and other universities, an excellent training is given, and many fine experiments are made in all the arts dramatic. Classes are held on the technique of dramatizing, prominence being given to modern dramatic writing. The Harvard Dramatic Club produces plays by Harvard graduates and undergraduates with the co-operation of a professional stage director of standing. Competitions are held, for glory and a prize of $500 — and a production at the Castle Square Theatre. Several of these prize winners have already become known to playgoers. Some years ago the interior of Sanders Theatre,— the academic theatre of the university,— was remodeled into a replica of an Elizabethan Theatre under the supervision of Professors Baker and Langford Warren (the latter representing the architectural department of the university), for the performance of Mr. Forbes Robertson's 'Hamlet' on the occasion of that distinguished actor's first representation of the part in America. Professor Baker also devised and directed, in co-operation with his students, the MacDowell pageant of Peterborough, N. H. A dramatic workshop within the university is famous throughout the country, and has trained and stimulated more than one man of superior talent for the wider scope outside its walls. At Yale University the main interests centre round the Dramatic Association. The roots of this Society were planted in 1899, four years after a talk on the drama by Mr. Joseph Jefferson in the Art School, 2 May 1895. Professor Phelps suggested the formation of the association, and two plays were produced at the Hyperion Theatre. The plays were a success, and the undergraduates were thereafter allowed to maintain an organization. Different in kind from the Harvard Hasty Pudding and the Princeton Triangle clubs in having a serious purpose, the Yale Dramatic Association was founded in the belief that the university is the natural cradle for the fostering of a better drama and for the encouragement of the new art of the theatre. Up to the year 1908, the Association took short Easter trips to such nearby towns as Hartford, Waterbury and Bridgeport. In 1908 the policy was changed and a long Christmas tour, the first of many such enterprises, was undertaken. In 1910 the Dramatic Association was incorporated. Perhaps the most outstanding event in its history was the presentation by Miss Maude Adams at the Grand Theatre, of 'What Every Woman Knows,' 19 April 1909. The entire gate receipts of the play were generously contributed to the building fund for the Yale Theatre. This proposed theatre is to cost $250,000; of which amount about $20,000 has been collected. The plays already performed include 'Iphigenia in Tauris'; 'Troilus and Cressida'; 'An Ideal Husband'; 'Harold'; 'Treasure Island'; 'Major Barbara'; 'Her Husband's Wife'; and 'The Legend of Leonora.' On 21 Oct. 1916, the Yale-New Haven Pageant was produced on the wide field of the Bowl, with more than 7,000 students, citizens and school children as actors, before an audience of nearly 70,000 people. The pageant visualized, step by step, the progress of Yale for 200 years. The production was in the hands of Mr. Francis Hartman Markoe, a Yale graduate who had also studied at Magdalene College, Oxford, and is the author of 'The Book of the Oxford Pageant.' On the scholastic side, too, Yale is eminently modern and practical, offering courses in contemporary drama, and in modern dramatic technique, in addition to the usual historical courses.

At the University of California the new era in dramatic work began with the dedication of the Greek Theatre in 1903. Under the leadership of Prof. C. M. Gayley of the department of English the students have received so much scope and wise guidance that this university has become one of the chief dramatic centres of the nation. All productions are under the supervision of the musical and dramatic committee. The chief play-producing body, The English Club, is a student organization which in the spring and autumn of each year gives some noteworthy performance in the Greek Theatre. The plays, since 1903, have included 'King Shudrakas'; 'The Little Clay Cart,' from India; 'Abraham and Isaac' (A.D. 1316); 'Thersytes' (A.D. 1539); Jonson's 'The Hue and Cry after Cupid'; Pinero's 'The Cabinet Minister'; Henry Van Dyke's 'The House of Rimmon'; Dekker's 'The Shoemaker's Holiday'; Stephen Phillips's 'Nero' and 'Paolo and Francesca'; Shaw's 'Caesar and Cleopatra'; Schiller's 'Mary Stuart'; Alfred Noyes's 'Sherwood'; Ibsen's 'The Vikings at Helgeland'; Sudermann's 'Teja'; Yeats's 'The Countess Cathleen'; Bulwer-Lytton's 'Richelieu'; Lawrence Housman and Granville Barker's 'Prunella'; four of Shakespeare's comedies and his 'Henry V.' For the Shakespearean Tercentenary in 1916 a dignified production of 'King Lear' was presented by the students in the Greek Theatre, without the usual stage settings and "business."

Stanford University dramatics date from the founding of the university in 1891. A few years later, an organization called the Sword and Sandals was founded for promoting the drama, and with a view to presenting a good standard or current play each year. This Society still exists as the mainspring of dramatic enterprise in the university, and their plays have ranged from the Greek classics to 'Seven Keys to Baldpate'; some of the more successful of these being 'The Great Divide'; 'Only Way'; 'Men and Women'; 'The Man from Home,' and, in 1917, 'Justice.' There are six other organizations for the production of plays given throughout the year, including a women's society, the "Masquers," and the junior class, which specializes on original opera. All dramatic enterprise is governed by the dramatic council, composed of the presidents of the various student organizations concerned, faculty representatives, the student stage-managers and the professional director.

At Princeton University, the famous Triangle Club devotes itself entirely to light comedy; and each year presents an original musical comedy, produced entirely by the undergraduates. They write the "book," the music, the lyrics and plan the entire production. The Triangle Club usually takes an extended trip during the Christmas vacation, presenting plays in many of the larger cities under the auspices of the alumni associations. The Princeton Dramatic Association devotes itself to the presentation of plays of a more serious type under the direction of the faculty of the English department. It has given such plays as Marlowe's 'Dr. Faustus' and 'The Jew of Malta'; Massinger's 'New Way to Pay Old Debts'; Beaumont and Fletcher's 'Knight of the Burning Pestle'; Shakespeare's 'Henry the Fourth' and 'Comedy of Errors'; Ben Jonson's 'The Silent Woman'; Ibsen's 'Pillars of Society'; Bernard Shaw's 'Candida' and Molière's 'Les Femmes Savantes.'

At the University of Pennsylvania, in Philadelphia, the most prominent dramatic event of the year is the Easter week production of the Mask and Wig Club. For 30 successive years the club has staged a new play in the nature of an extravaganza or a burlesque, the book and music being written entirely by its members. About 100 undergraduates usually take part. Other dramatic events are the round of French, German, Italian, Old English and Greek plays by the various departments. In May 1916 'The Comedy of Errors' was presented by the Philomathean Society in a specially constructed theatre modeled after the old Globe Theatre in London. This was one of the principal features of the Shakespeare Tercentenary celebrations in Philadelphia in 1916. In the spring of 1915 a company of English actors gave a fine production of 'Iphigenia in Tauris' and 'The Trojan Women' before an audience of more than 10,000 people. In June 1916 a production of Verdi's 'Aida' was attended by people from all over the country. This is said to have been the most magnificent open-air operatic event ever given in America.

Brown University has a reputation for good acting and shows enthusiasm in the cultivation of audiences beyond the usual academic circles. The Sock and Buskin Society gives spring and autumn productions of modern classical plays, and aims in particular to keep alive the best of the old comedies in English, and good farces.

The University of Vermont has for some years carried on the interest in dramatics with purely student undertakings, and with open-air performances under the strict supervision of the university. A club for men and another for women present old English comedies, Shakespeare and the modern drama, in both separate and joint productions. In addition, the modern language clubs read and produce plays.

At Dartmouth College the dramatic renaissance has gathered up the best available talent among expositors and critics in New England. No college in the country has shown more energy in the way of dramatic art than Dartmouth. On the practical side the professional coach was dispensed with, and the full responsibility for productions given over to the Dramatic Association of the undergraduates. Within a year the Association had a repertory of 22 plays, not including those produced during the summer session. Every class of play, from Maeterlinckian gossamers to vaudeville sketches and Broadway melodramas, were presented.

The women's colleges of the United States are in no way behind the men's in their interest in the subject. At Vassar College, the Philalethean Society aims to interest and instruct its members in dramatic art; and all students are admitted on payment of dues. Five plays by the different chapters, called the Hall Plays, are given each year: Three major and two minor. The three major plays for the year 1915–16 are typical selections: 'The Melting Pot,' 'Deirdre of the Sorrows' and 'The Tempest.' The Idler Club of Radcliffe College gives six productions each year, mainly the works of modern dramatists of the advanced school. Only one of these six productions is open to the general public; but the final play of the year, usually presented out of doors, is repeated at Commencement. All the productions are staged, coached, costumed, lighted, etc., by the girls themselves. A recent development is the competition for original plays, and the production of all that reach a given standard. Smith College is active — particularly on the literary side — and has lent the weight of its patronage to the one Municipal Theatre in the United States, at Northampton. At Wellesley College dramatic events fall into major and minor classes. The former include the senior play given in June, and the two society plays usually performed in December. The minor events are the less formal plays of the year given by the "Barnswallows," a social organization which includes the entire college. The Bryn Mawr College has a tradition of acting that stands among the best of college work. Every year each class undertakes a production. The sophomores and the seniors are usually responsible for a modern comedy; and the vaudeville "Freshman Show" and "Banner Show" are annual events. The plays at Bryn Mawr are performed entirely by the students; and no men are admitted, except to the Glee Club's operas and the May-Day celebrations.. The Glee Club in 1915–16 staged 'The Mikado.' Once in four years the college unites in a May-Day Celebration of an elaborate nature which has attracted wide attention in Europe, as well as in America (consult 'Bryn Mawr May Day Revels,' in the New York *Outlook*, 6 Aug. 1910). For the first time in its history, 1916–17, Bryn Mawr opened a course in dramatic exposition. Dramatics plays a large part in the college life of Goucher College (formerly the Women's College), Baltimore, Md. This is one of the few colleges in the country with a fully equipped theatre (the seating capacity 1,200). There is a "Senior Play," usually Shakespearean; but, on occasion, it is a play by Molière or Sophocles, or a modern writer,— given by the senior class after six months' rehearsal. The college literary society, Agora, has a dramatic department and presents plays with simplified scenery three or four times a year. Stress is laid, not upon costumes and accessories, but upon the elocution and acting of these works, which are deemed to be highly educational. This Society also presents each year a 16th century Christmas festivity, with Morris dances, sword play and a Nativity play; and, in the spring, an outdoor performance of a masque, with folk dancing, etc. The classes also give class plays. For nearly all the plays the students themselves make costumes, scenery and properties.

In the Middle West, the interest in dramatic work in colleges and universities is almost unbounded. Ohio University, the oldest seat of higher learning in the "Old North West," finds that no department of the university evokes a broader and deeper concern than the school of oratory, of which the Players Club is the outgrowth. There is a course in dramatics giving a full knowledge of stage technique, with a view toward preparing young high school teachers and others for the demand for trained stage directors in the schools.

Oberlin College, Ohio, ever since its foundation in 1833 has held consistently that the fine arts are essential factors in a liberal education, and the drama came into its own here somewhat more thoroughly than in the majority of American colleges. Actual work is required for the Oberlin degree; and, in keeping with this fact, plans have been drafted for an even more fully equipped theatre than the college has at present. Greek, Shakespearean and modern plays are presented with completeness and integrity. Every detail, even to the most approved electrical equipment, is carried through by the undergraduates; some of these students having had professional training in the scenic studios of New York and elsewhere. Through the enthusiasm of Dr. Philip D. Sherman, the head of the department of English, Oberlin is kept directly in touch with the most advanced movements in the world's theatres; and all touring art-theatre companies are encouraged to make a stand here.

Butler College, Indianapolis, within the last three years has developed a sound taste for theatricals, and particularly for opera, under the auspices of the I. T. S. Club, a secret order, now a chapter of Duzer Du. In the spring of 1916 Butler, DePauw University and Allegheny College united in what is hoped will be a movement for a national dramatic fraternity.

The department of English at the University of Minnesota, under the leadership of Prof. Richard Burton, is in close touch with the three undergraduate dramatic clubs of the university. These present a number of "worth while" plays during the college year. A professional trainer is employed; and the college sends out over the State, as part of the extension work, several good plays yearly. This work is recognized to be so vital that the actors are excused from examinations because of it. In 1915 this university opened a little theatre on the campus. It seats 300. Playwriting is taught in class, and the product of the students tried out in the theatre.

At the University of Nebraska in 1915 a department of drama was organized which has shown extraordinary vitality, and is somewhat unique in its methods. Forty public productions were given in its own theatre and on the road. When expert in their work in this department the students are elevated to another company, the University Players. This is operated on the plan of a stock company, and a new play is shown every month at the Temple Theatre. The most successful of these plays are taken on the road for trips of from 2 to 10 days. Each branch of dramatic work has its group of students; and an original play, with music written entirely by the undergraduates, is produced every year. Nothing is more notable in the intellectual life of the Northwest than the theatre craftsmanship of the University of North Dakota, under the guidance of Prof. Frederick H. Koch of the English Department. Two original contributions to the movement toward a new drama are claimed by this centre: The first, a plan of communal authorship, by which a masque, 'Shakespeare, the Playmaker,' was designed and written by a group of 20 students to commemorate the tercentenary of the death of Shakespeare; and, the second, the establishment in 1914 of a new form of the open-air theatre, the Bankside Theatre,— a narrow stream running between the sunken stage and the amphitheatre; the desired effect of distance being gained, while the acoustic properties are intensified by the frontage of water. The communal masque has been published in book form by the university. The dramatic movement at North Dakota has had an all round steady growth of 10 years. The Sock and Buskin Society is the focal point of the work and supplements the university courses. They have also an indoor theatre on modern lines, "The Little Playhouse."

In the colleges and universities of the Southern States the new movement has begun, as it invariably begins everywhere, with masques and pageants, many of these being carried out on a grand scale; the Shakespearean Tercentenary celebrations in the spring of 1916 serving to initiate many Southern institutions into various forms of community drama. Perhaps the most conspicuous of the kinds were those of Greensboro College, N. C., and of the University of North Carolina. The universities of Texas, of Tennessee and of the South are rapidly growing into centres of modern dramatic art on the scale of the great Northern academies.

At Columbia University, New York, as in some few other universities, emphasis is laid on straight theory rather than on theory-*cum*-practice. The proximity of Columbia to the Metropolitan theatrical centre is deemed an important argument against this particular university maintaining a theatre of its own. However, the department of public speaking does, in part, supply the lack of a students' theatre. The dramatic publications of this university are of special interest to students of the theatre, and Prof. Brander Matthews' theatrical museum is one of the sights of New York. (Consult Townsend, George, 'Classic Plays in Holiday Season,' 1910). As the amateur stage increases in strength and in credit, this work promises to become a still more important feature of university life and work (consult Mackaye, Percy, 'Civic Theatre,' and a plea for the propagandist play in 'Amateur Acting at Oxford and Elsewhere' by the Hon. and Rev. James Adderley in the *Oxford and Cambridge Review*, 1908. The University Theatre Association Plan, by Mr. Charles D. Coburn, is a plea from the professional standpoint). We may venture to speculate that it is only a question of a few years for the modern university to make the arts of the theatre and other fine arts as much a part of the curriculum as, say, medical or agricultural science.

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DUNCAN MACDOUGALL,
Formerly Lecturer on Public Speaking at Saint Andrew's College, University of Sydney, Australia; and Lecturer for the Department of Education, New York.

COLLEGE ENTRANCE REQUIREMENTS. A term among the institutions of higher learning covering the moral, physical and intellectual qualifications deemed prerequisite for the enrolment of a student in a particular course or department. The moral requirement is generally not more than a statement of good character from some responsible person in behalf of the candidate. The physical requirements are usually the attainment of the minimum age of 17 years (variable in different institutions, and waived often in case of exceptional students who have attained the intellectual requirement at an earlier age); and soundness of body and mind. The intellectual requirement embodies the main problem of college admission. It includes the satisfactory completion of a group of studies based on the work at a school of recognized standing. For convenience, this academic work is divided into units, each of which expresses about one-fourth of a year's work in a preparatory school or high school. Thus the subject of plane geometry is estimated at one unit, and four books of Cæsar at the same value. The number of units for entrance varies usually from 14 to 16. The subjects for admission are divided into two groups: (1) Specified subjects; (2) elective subjects. From two to three years' study of English is usually specified; algebra, plane geometry and a year or more of foreign language. The full quota of units is made up of electives, which include studies in history, science, mathematics, language, economics, music, drawing, and the manual and industrial subjects. The admission to technical courses specified some previous scientific knowledge also. The requirements are most diverse, some institutions admitting students by examination only (such as Bryn Mawr, Columbia, Harvard, Haverford, Princeton, Radcliffe, Stevens, Yale); others by presentation of certificate from a recognized secondary school; some on probation upon the recommendation of high school principals. A great majority of colleges admit students on certificates, a system which in many instances includes an intelligent inspection of the schools from which certificates are acceptable. Students are usually admitted to college under one of three general classifications: (1) Regular students who have fully met the requirements and are candidates for a degree; (2) conditioned students, or those who have failed by a small margin to meet the full requirements, but who are admitted as candidates for a degree; (3) special students or those who do not meet the regular entrance requirements, but who, usually on account of maturity of years, are deemed qualified to enter certain courses, and are not candidates for a degree. There is a general tendency at present to restrict the admission of special students, as many of these in the past have made use of this means of entering college life to enjoy its pleasures without any commensurate exertion on their part. The purposes of making a standard for entrance are (1) to eliminate the unfit; (2) to keep the secondary schools vital and purposeful.

The history of college entrance requirements dates back to Harvard 1642, where a speaking knowledge of Latin, ability to make Latin verse and a thorough grammatical education in Greek were the only requirements. These remained unchanged until 1734, and even then were modified only a very little, when a knowledge of the rules of Latin prosody was substituted for a speaking knowledge of Latin. In 1745 Yale added common arithmetic and the other colleges soon followed its example. With the establishment of the academy as the dominant secondary school in place of the old Latin grammar school, there came the enlargement of the curricula of both schools and admission requirements. Geography was added in 1807; geometry, history, algebra and foreign languages followed in its wake. As late as 1897, however, 402 of the 432 colleges in the United States required Latin and 318 Greek. Since then the expansion has been along the lines of English and sciences. There is at present much diversity in requirements for entrance.

Until a comparatively recent time, examinations for entrance were general. But with the widening of the college and high school curricula, the introduction of the elective system and the absorption of the academies into the public school system, the old division between the secondary schools and colleges tended to break down. In 1870 Michigan began the system of accrediting schools (adopted from the Prussian State system) from which pupils might be admitted to colleges without further examination. This plan has been adopted by all of the colleges and universities except a few of the more conservative ones, listed above. The certifying body varies. Sometimes it is the college or a group of colleges. In New York, Minnesota and elsewhere certification is controlled by the State. The admission by certificate from schools does not include those students from non-accredited schools, nor those prepared by private tutors. The arguments in favor of this form of admission are: That it brings a close union between school and college; that it lifts the high school standard; that it equalizes instruction in high schools for students not preparing for college; that the evil of cramming for examinations is obviated and the student studies the subject *per se;* that the record of four years' work is a fairer test than examinations taken under strange conditions; that it secures a better grade of pupils than the examination system. Those in favor of the examinations argue that they raise the standard of work in secondary schools; keep the college up to a high standard of admission; that they really test the student's proficiency; that even though conducted under strange and unusual conditions, they do not rate the student unfairly; that the privilege of certification is abused by principals; that competent inspection of secondary schools being difficult and costly, poor schools often remain on the list; and lastly, that examination procures a better type of student for the college. All of these arguments are matters of opinion, and remain to be proved.

One of the most effective and far-reaching movements in this whole field is the work of the College Entrance Examination Board, an association of colleges and preparatory schools for the purpose of establishing: (1) A fair degree of flexibility in high school and college curricula and college entrance requirements; (2) uniformity in standards of high school and college; (3) adequate and uniform administration of policies. The first effort grew out of a conference of New England colleges in 1879, since when it has enlarged its work and scope considerably. Various local college entrance examination boards have been formed, centralized under the National Conference Committee on Standards of Colleges and Secondary Schools, composed of delegates from the various boards, and the United States Commissioner of Education. This committee publishes a statement of the ground which should be covered by secondary schools and arranges for an impartial marking of examination papers. Its report for the year 1915–16 shows the excellent progress of the accredited school system of admission. A modified plan, which involves both certification and examination, was adopted as an alternative by Harvard in 1911, by Princeton and Yale in 1915. In June 1916, the examinations prepared by the College Entrance Examination Board were adopted as the standard of admission for all colleges represented on the Board. The advantages of this centralization are: (1) That the papers embody a wider range of preparatory training; and (2) it gives the university a much wider distribution of its examination papers. The new method will go into effect at Mount Holyoke, Smith, Vassar and Wellesley in 1919.

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COLLEGE DE FRANCE, kŏl-läzh dė fräns, a celebrated institution founded by Francis I between 1518 and 1545, originally a *Collége de Trois Langues* or a college in which would be taught Greek, Hebrew and Latin, is a very important educational institution, now giving instruction over a very wide field of literature, history and science. The University of Paris at various times sought to gain control over it but it managed to maintain its independence and its activity has been continuous since its foundation. It is distinguished for its freedom of teaching and its encouragement of scientific research. It is under the charge of the Minister of Public Instruction. It is independent of the University of France, is under the direct supervision of the Minister of Public Instruction and is supported by the government. As in the Sorbonne, the lectures are gratuitous, and for the most part are designed to attract auditors older than ordinary university students. No examinations are held, and no diplomas given. The college comprises two faculties, one literary, one scientific; each has about 20 professors. Among the professors have been some of the most distinguished scholars and scientists in France, such as Laboulaye, Gaston de Paris, Saint-Hilaire, Ramus, Gassendi, Sylvestre de Sacy; Renan, Michelet, Rollin and others.

COLLEGE FRATERNITIES. See GREEK LETTER SOCIETIES.

COLLEGE OF WOOSTER, The, at Wooster, Ohio, was chartered in 1866 as The University of Wooster and was renamed in 1914. It was founded by the Presbyterian Synod of Ohio, which elects its governing board of trustees. The 100-acre, hill-top campus is of unusual beauty. The buildings, because of the burning of the original building in 1901, are all modern and cost over a million dollars. The productive endowment is about a million and a quarter. The library has 43,000 volumes. In the four college classes are 299 men and 218 women. Students in the academy number 178. The teaching staff numbers 51; the graduates to date 1,954.

COLLEGES, Land Grant, colleges established and maintained in whole or in part by the Land Grant Act of 2 July 1862. Justin S. Morrill, a representative from Vermont, introduced in Congress the first bill asking that grants of government land be donated for the purpose of aiding in the education of the people, in scientific and technical subjects. This bill, introduced in the lower House 14 Dec. 1857, authorized the establishment of colleges of agriculture and mechanical arts in all States, and provided for the support of said colleges, 20,000 acres of land for each senator and representative. The bill passed both Houses but was vetoed by President Buchanan. In December 1861 Mr. Morrill introduced a new bill, bestowing 30,000 acres of land for each member of Congress for the establishment and maintenance of industrial colleges. Ben Wade, of Ohio, introduced the bill in the Senate. The House committee on public lands made an adverse report, but the bill passed both Houses and was approved by President Lincoln 2 July 1862. This act gave to the cause of industrial education 30,000 acres of land for each senator and representative in Congress to which the States were entitled by apportionment of the census of 1860, or in all, about 13,000,000 acres of land for educational purposes. The act was entitled «An act donating public lands to the several States and Territories who may provide colleges for the benefit of agriculture and mechanical arts.» The object of the act is expressed as follows:

«The endowment, support and maintenance of at least one college where the leading objects shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life.»

In 1889 Mr. Morrill and others began to form plans to secure another appropriation, and Mr. Morrill introduced another bill in Congress, providing that there shall be appropriated annually to each State, out of the funds arising from the sale of public lands, the sum of $15,000 for the year ending 30 June 1890, and an annual increase by the additional sum of $1,000 to such appropriation for 10 years thereafter until the appropriation shall become $25,000, at which figure it shall remain fixed. The bill passed both Houses and was approved by President Harrison 30 Aug. 1890. The act says that this appropriation shall be applied «only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural and economic science, with special reference to their applications to the industries of life, and to the facilities for such instruction.» Provision was made at this time for separate institutions for white and colored students in such States as desired to make this arrangement.

The Act of 4 March 1907 amended the Act of 1890 by increasing the yearly appropriation and extending the conditions for its use. The benefits of the Act of 1862 or of later acts in lieu of it are received by 48 States, and 53 institutions are thereby aided — one in each of 43 States, two in Massachusetts and Missouri and one colored and one white institution in Mississippi, South Carolina and Virginia each. The appropriation is now fixed at $50,000 to each of the 48 States and the two insular possessions, Hawaii and Porto Rico, and aids 69 institutions; 17 States maintain special colleges for colored students, which receive aid from this fund.

The reports for the year ending 30 June 1914 received by the commissioner of education from the presidents of the land grant colleges show that the States have received 10,931,267 acres of land, of which 910,586 acres remain unsold. The invested funds from the sale of the land and other sources of revenue give their schools and colleges a total annual income of approximately $38,559,397.

The total number of students in the agricultural and mechanical departments was 115,054. For information in detail about each land grant college, consult ‘Report of Commissioner of Education’ (Vol. II, Washington 1915).

COLLEGES FOR TEACHERS, or colleges in which are special departments for the study of the history of education, psychology as applied to teaching, pedagogy, and all subjects bearing upon methods of instruction.

To the English schoolmaster, Richard Mulcaster, is given the credit of being one of the first, if not the first, to propose a college for the training of teachers. He classified his chief reasons for desiring the establishment of such a school under four heads: (1) Importance of the work, it will make or mar the State; (2) The great numbers who are to teach and be taught; (3) Need of the profession of teaching, professors must be trained; (4) That teachers may acquire wisdom is arranging and presenting subjects, in economizing time and that they may attain staidness of demeanor.

Instruction in the science and art of teaching was included in the university scheme that was proposed for Columbia College in 1858, but then without avail. Again President Barnard urged upon the trustees of the same college in 1881 and 1882 the same plan, which he had now worked out much more fully. The next step forward was the organization in New York, in 1888, of Teachers' College, which was chartered the following year. While this college was organized outside of the Columbia system, it was still under the control, in great part, of Columbia men, and was loosely affiliated with the college. The last step in the evolution came in 1898, when Teachers' College was made an integral part of the educational system of Columbia University. The president of Columbia is president also of the college, and the university professors of philosophy and education and of psychology are members of its faculty, while the college is represented in the university council by its dean and an elected representative. The college, however, continues its own separate organization, having its own independent board of trustees, which is charged with the sole financial responsibility of its management.

Teachers' College is the professional school of Columbia University for the study of education and the training of teachers, ranking with the schools of law, medicine and applied science. The university accepts courses in education as part of the requirement for the degrees of A.B., A.M., and Ph.D.; while graduate students who prefer to devote their entire time to professional study may become candidates for the higher diploma of the college. The college diploma is conferred upon students who have successfully completed some one of the general courses, and a departmental diploma upon those who have fitted themselves for particular branches of school work. Undergraduate students of Columbia and Barnard colleges may, if they desire, obtain the diploma of Teachers' College at the same time that they receive the degree of Bachelor of Arts. The Horace Mann school, fully equipped with kindergarten, elementary and secondary classes, is maintained by Teachers' College as a school of observation and practice.

These are the undergraduate courses: Secondary course leading to the degree of A.B. and the college diploma; general course leading to the college diploma in elementary teaching; general course leading to the college diploma in kindergarten teaching. Then there are several courses leading to the college diploma in art, domestic art, domestic science and manual training. Candidates for the first of these courses must be either college graduates or candidates for the degree of A.B. in Columbia University. There is a combined course of study prescribed for the degree of A.B. in Columbia University and the diploma of Teachers' College. Graduate work is also well developed. The Extension Department, which was established in 1902, since when it has increased wonderfully in importance, furnishes afternoon and evening courses for those whose occupation prevents them taking the regular course of study. The Speyer School and the Horace Mann high, elementary and kindergarten schools are equipped and used by the college as schools of observation and practice. The college possesses an educational library of over 60,000 volumes, an extensive educational museum and a residential building, Whittier Hall, presented to it in 1908. In the following year the School of Household Arts, costing over $500,000, was opened. In 1918 the college buildings and grounds were valued at about $4,000,000. It had 230 instructors and 4,883 students, in its college and related work. For the year 1898-99 the teaching staff counted more than 60 persons.

New York University School of Pedagogy, established in 1890, aims to furnish graduate work equal in range to other professional schools. The school is an organic part of the university, having its own dean and faculty. More definitely, its aim is declared to be to furnish thorough and complete professional training for teachers. The plan of the school places it upon the same basis as that of the best schools of law, medicine and theology. The work is of distinctively university grade, and graduates of colleges and normal schools, and others of equal experience and maturity, may find in this school opportunity for the thorough study of higher pedagogy. In 1898-99, the instruction was distributed in four major and eight minor courses, namely, history of education; physiological and experimental psychology; analytical psychology; history of philosophy; physiological pedagogics; elements of pedagogy; comparative study of national school systems; æsthetics in relation to education; sociology in relation to education; institutes of pedagogy, ethics, school organization, management and administration. Special facilities for research are offered to the seminaries. The degree of Master of Pedagogy is conferred upon candidates who have completed five of the foregoing courses, three of them majors; the degree of Doctor of Pedagogy upon candidates who have completed the four major and five of the minor courses.

Clark University, opened in 1889, has given much attention to education from the first, and the subject has now been made a sub-department in the department of psychology, in which a minor may be taken for the degree of Doctor of Philosophy. The work is intended to meet the needs of those intending to teach some other specialty than education, but who wish a general survey of the history, present state, methods and recent advances in the field of university, professional and technical education, and of those who desire to become professors of pedagogy, or heads of instruction in normal schools, superintendents, or to become professional experts in the work of education. Great stress is placed on original investigation. The president, Dr. G. Stanley Hall, has been the leader of the child study movement in the United States. *The Pedagogical Seminary* is the organ of the educational department of the university. It is an international record of educational research and literature, institutions and progress, and is devoted to the interests of education of all grades.

The department of pedagogy in the University of Chicago has as its primary aim to train competent specialists for the broad and scientific treatment of educational problems. The courses fall under three heads: Psychology and related work, educational theory and the best methods of teaching the various branches. Stress is laid upon the relation of pedagogy to other subjects, and courses are offered in the proper departments in which the methodology of such subjects is employed.

The University of Chicago has also established a college for teachers on a somewhat novel plan. This institution, which was founded in October 1898, is an outgrowth of the class study department of the extension division of the university. It is a "downtown" college, and aims to provide instruction of high grade for busy people; or, more definitely, "for any and all persons qualified to do the work, who are so engaged by other imperative duties as to make continuous attendance at the other colleges of the university impracticable." The work of the college is of the same grades as that of the other colleges of the university. See CHICAGO, UNIVERSITY OF.

The University of Wisconsin school of education is an expansion of the former department of education. The four main lines of instruction are the history, the philosophy, the science and the practice of education. The school aims to afford practical instruction to intending teachers, professors, principals and superintendents, and to those students who desire to pursue studies and investigations in the science of education.

COLLEGES FOR WOMEN. Three types of the collegiate education for women in the United States prevail. The first in time and in popularity is known as coeducation; the second, as separate education; and the third, as co-ordination in education. Under the first form, men and women are educated together under identical conditions; under the second, women are educated by colleges founded and administered for them as women; under the third, there are established in the same university two colleges, one for men and one for women. The third form is subject, however, to considerable varieties in administration.

The first college founded for both men and women was Oberlin. Its charter was granted in 1834. The college was the result of the philanthropic and missionary movements of the first decades of the last century. The town and the Institute, as the college was called for about a score of years, were closely allied. In the first circular published regarding the institution, it was said that among its great objects was the extending of the benefits of the most useful education to "both sexes." "The elevation of female character" was also noted as a purpose. The giving of a college education to both men and women together was not a primary thought. The primary thought was to offer the best education to women. The conditions obliged the giving of the education to both sexes upon equal terms. In the first year of the college, 40 women were enrolled. Few of them were fitted, however, to pursue college studies. A preparatory department was formed. In 1837 four women offered themselves as candidates for college rank. Their classification was more or less irregular. At the commencement of 1841 three women received a degree, the first women to receive a degree in arts in the United States. For about a score of years Oberlin alone received women into its classes on the same terms, substantially, as those on which it received men.

The second step in the education of men and women together was taken 20 years after the beginning was made at Oberlin in another Ohio town. Antioch College, in Yellow Springs, was founded by Horace Mann in 1852. In his inaugural address Horace Mann declared himself heartily in favor of what is now known as coeducation. He affirmed that coeducation is the only method to be pursued, at least for many years, on the ground of its relative inexpensiveness. He believed that social intercourse between young men and women would prove advantageous to each, preventing manners from becoming rude and sentiments coarse. He believed that the peril of forming undesirable attachments is less under academic than under ordinary social conditions.

The beginning thus made in two Ohio colleges advanced rapidly. Its chief field of growth lay in the universities founded by the various States. In 1856 Iowa, in 1866 Kansas, in 1868 Minnesota, in 1871 Nebraska, founded universities for both men and women. The University of Indiana, founded in 1820, was in 1868 opened to women. The universities of Michigan, of Illinois, of California, of Missouri, were open to women in 1870, and the Ohio State University three years after. In 1874 Wisconsin adopted complete coeducation. At the present time every State university, excepting three or four, is open to women.

The older parts of the country approached the question of the education of women through the establishment of new colleges for them. It was easier to found colleges for women than to adjust colleges already organized for men, and whose conditions and traditions were established, to the admission of women. Yet Middlebury, Colby and other colleges were opened to them; and Boston University, Bates in Maine and Cornell in New York were coeducational either in the beginning or soon after. The founders of the four more eminent colleges for women in the seventh and eighth decades of the 19th century were moved by the same purpose. They desired to establish institutions which should give to women an education as good as the older colleges were giving to men. The purposes of Matthew Vassar, of Sophia Smith, of Henry F. Durant, the founder of Wellesley, and of Dr. Joseph W. Taylor, the founder of Bryn Mawr, were alike slow in fruition. In the year 1845, at the age of 53, Matthew Vassar decided to devote a large portion of his estate to some benevolent purpose. It was not until 20 years after that Vassar College was opened to students. In the year that Vassar received its acts of incorporation Sophia Smith began to think of the establishing of a college for women. The college was incorporated in 1871 and opened for students in 1875. In 1864 Henry F. Durant, losing by death an only son, determined to use a part of his estate in philanthropy. In 1870 the institution was incorporated as the Wellesley Female Seminary; three years after the name was changed to Wellesley College, and in 1877 the college was authorized to grant degrees. For many years Dr. Joseph W. Taylor considered the question of devoting his estate to the education of women.

In these endeavors for the higher education of women help was derived from a foundation laid at Elmira in the year 1855. But the foundation was not adequate for offering the training which women were desirous of receiving. Its chief value, therefore, lay in the incentive it gave rather than in its actual educational achievement.

The general purpose and conditions under which all these foundations were laid are well indicated in an address given by Matthew Vassar to the trustees of his college in June 1864 at the time when the question of the election of professors was being discussed.

"It is my hope — it was my only hope and desire — indeed, it has been the main incentive to all I have already done, or may hereafter do, or hope to do, to inaugurate a new era in the history and life of woman. The attempt you are to aid me in making fails wholly of its point if it be not an advance, and a decided advance. I wish to give one sex all the advantages too long monopolized by the other. Ours is, and is to be, an institution for women — not men. In all its labors, positions, rewards and hopes, the idea is the development and exposition, and the marshaling to the front and the preferment of women — of their powers on every side, demonstrative of their equality with men — demonstrative, indeed, of such capacities as in certain fixed directions surpass those of men. This, I conceive, may be fully accomplished within the rational limits of true womanliness, and without the slightest hazard to the attractiveness of her character. We are indeed already defeated before we commence if such development be in the least dangerous to the dearest attributes of her sex. We are not the less defeated if it be hazardous for her to avail herself of her highest educated powers when that point is gained. We are defeated if we start upon the assumption that she has no powers save those she may derive, or imitate, from the other sex. We are defeated if we recognize the idea that she may not, with every propriety, contribute to the world the benefits of matured faculties which education evokes. We are especially defeated if we fail to express, by our acts, our practical belief in her pre-eminent powers as an instructor of her own sex."

The third type of the collegiate education of women is known as co-ordination. It represents the inclusion in, or the alliance of, a college for women with a college for men. Certain communities, in their desire to promote the education of women, and in their unwillingness to duplicate educational equipment, have established colleges for women as an annex to, or as institutions parallel with, the institutions founded at an earlier date for men. This method represents the English tradition. Girton, at Cambridge, existed nine years before the foundation of the Society for the Collegiate Instruction of Women, organized in Cambridge, Mass., in 1879. The more conspicuous of these colleges are Radcliffe, affiliated with Harvard; Barnard, affiliated with Columbia; the Woman's College of Brown University, the College for Women of Western Reserve University of Cleveland, and the H. Sophia Newcomb College, affiliated with Tulane University. The intramural administration of these colleges differs from each other. In Radcliffe, Barnard and Brown at least, the larger part of the instruction is given by members of the faculty of the older college for men. In the College for Women of Western Reserve University a distinct faculty is established which is co-ordinate with the faculty of the college for men — Adelbert — of the same university.

Colleges of each of these three types have special advantages, and are subject to special disadvantages. Each apparently has come to occupy a permanent place in American education. Coeducation, however, is by far the more popular. About nine-tenths of all colleges are coeducational institutions. The number of degrees conferred on women in all American colleges in the last year was about 4,000. The more common degrees are A.B., Ph.B., B.L. and B.S., of which A.B. is conferred on about five-eighths of all candidates.

CHARLES F. THWING,
President of Western Reserve University, Cleveland.

COLLEGEVILLE, Minn., village in Stearns County, on the Great Northern Railroad, nine miles northwest of Saint Cloud. Saint John's Abbey and Saint John's University, in charge of members of the order of Saint Benedict, are the chief institutions of the village. The university was opened in 1867. The number of students is greater than the number of inhabitants of the village. Pop. 606.

COLLEGEVILLE, Pa., borough in Montgomery County. It is situated on the Perkimon River, the Philadelphia and Reading Railroad, and is 27 miles northwest of Philadelphia. Ursinus College, established in 1870, is an institution belonging to the German Reformed Church. The manufactures are iron machinery, boiler-making and hot water heaters. Pop. 621.

COLLEGIATE ATHLETICS. See EDUCATIONAL ATHLETICS.

COLLES, kōlz, **Christopher**, American philosophic adventurer: b. Ireland about 1738; d. New York 1821. In 1765 he set out, a wanderer from his native land, and we find him in Philadelphia in 1772, delivering illustrated lectures upon pneumatics. He is said to have been the first to build a steam engine in this country. In April 1774 he proposed to erect a reservoir for the purpose of conveying water through the several streets of the city of New York. His proposals were "read and referred." In 1775 he delivered lectures on gunnery, and was further employed in giving instruction to the artillery department of the American army in the principles of projectiles. Colles was the first who suggested canals and improvements to connect Lake Ontario with the Hudson. According to the records of the assembly of New York, in November 1784 he presented a memorial on the subject, and in April following a favorable report was made thereon. In 1808 Colles published an elaborate pamphlet on the interests of the United New York, and in 1789 a book of roads through New York.

COLLIE, the domestic sheep-tending dog developed in Scotland, and for a long time bred there exclusively, but now known in all parts of the world. It is one of the most beautiful, and perhaps the most intelligent, of all dogs, and many anecdotes are told illustrative of its sagacity. Collies have for hundreds of years aided the Scotch shepherds in caring for their flocks, under all conditions and in all sorts of weather. To meet the inclemency of stormy days and cold nights, these dogs have acquired an outer coat of thick, rough hair, black or black-and-tan in color. It has an undercoat so close and soft that, even when it is parted, one can scarcely see the dog's skin. The chief points of these dogs are long, sharp heads; bright, keen eyes, set rather close together; small ears, drooping at the tips; a full ruff of hair around the neck; strong, wiry frames; and rounded feet. Their intelligence is remarkable — almost human; and their affection so constant that they have been known to die of grief after the death of a master.

The collie measures from 22 to 24 inches at the shoulder and weighs generally from 45 to 60 pounds. He is as alert as a fox and as fleet as a deer. In fact, no dog, except the greyhound, can excel him in speed and grace of movement, and it is safe to state that no dog is so faithful and trustworthy a companion to man, for the collie gives implicit obedience and unfaltering loyalty to his master, and will yield his life rather than desert his master's charge. This it is that makes him invaluable as a sheep-dog. Detailed information in regard to the collie may be found in most books relating to dogs (q.v.), and special books treating of him from the point of view of both the shepherd and the fancier are accessible. Consult Lee, 'Collie or Sheep-Dog'; and Wickham, 'Practical Training of the Shepherd Dog.'

COLLIER, Arthur, English philosopher: b. Langford Magna, Wiltshire, 12 Oct. 1680; d. there 1732. He was educated at Pembroke and Balliol colleges, Oxford, and in 1704 became rector of Langford, a living which had belonged successively to his great-grandfather, grandfather and father, and which he retained till his death. In 1713 he published a work entitled 'Clavis Universalis,' in which he maintained both the non-existence and the impossibility of the existence of any objects external to the mind. Berkeley had three years before advanced incidentally his theory of the negation of an external world, but the two philosophers appear to have had no knowledge of each other, and it is certain that Collier meditated upon his opinion for 10 years before promulgating it. Though they developed simultaneously the first systematic scheme of absolute idealism, and though Collier was inferior to his contemporary rather in the graces of composition than in acuteness or method, yet the 'Clavis Universalis' attracted not the slightest attention in England. In Germany a copious and able abstract of its contents was given in 1717, in a supplemental volume of the 'Acta Eruditorum,' and it was quoted by Wolf, Bilfinger and others. In 1756 a complete translation of it into German was made by Eschenbach. Thus rendered accessible in Germany, Collier has enjoyed among the thinkers of that country high repute for talent and originality, and the best comparative view of his doctrines and those of Berkeley is that given by Tennemann. Other publications of Collier were the 'Specimen of True Philosophy' (1730); and 'Logology' (1732). In religion he was an Arian, and at the same time a high churchman on grounds which his associates could not understand.

COLLIER, H. Price, American writer: b. 25 May 1860; d. 3 May 1913. He was educated at Harvard. Entering the Unitarian ministry, he was for nine years in charge of churches in Hingham, Mass., and elsewhere, and during the Spanish-American War served as a naval officer. For two years he was European editor of the *Forum,* and wrote a volume on "Driving" (1903) in Macmillan's *Sportsman's Library.* But he attained celebrity as the writer of essays on national characteristics, which were marked by much insight and real literary quality. He has published 'Essays'; 'Mr. Picket Pin and His Friends'; 'America and the Americans from a French Point of View' (1897); 'England and the English, from an American Point of View' (1909); 'The West in the East from an American Point of View' (1911); and 'Germany and the Germans from an American Point of View' (1913). At the time of his death he was preparing a similar discussion of Norway and Sweden.

COLLIER, Henry Watkins, American jurist: b. Lunenberg County, Va., 17 Jan. 1801; d. Bailey's Springs, Lauderdale County, Ala., 28 Aug. 1855. He was educated in the Abbeville District, S. C., where his father settled in 1801, removed with the family to Madison County, Ala., in 1818, and studied law in Murfreesboro, Tenn., and at Huntsville, Ala., where he was admitted to the bar and began practice. In 1823 he settled in Tuscaloosa, where he was elected district judge in 1827. In 1836 he was appointed associate justice of the Supreme Court of Alabama, in 1837 was made chief justice, and held that office till 1849, when he was elected, without opposition, governor of the State. His support was sought both by the Southern Rights and the Union parties; but he favored neither side of the question that then agitated the Southern States, and in 1851 was renominated and elected without a regular nomination. When his second term expired he retired to private life.

COLLIER, Jeremy, English bishop: b. Stow Quy, Cambridgeshire, 23 Sept. 1650; d. London, 26 April 1726. He was educated at Caius College, Cambridge, entered the Anglican Church in 1677 and was rector of Ampton, Suffolk, in 1679. The revolution of 1688 found in him a most zealous opponent, and he not only refused to take the oaths to the government of William and Mary, but came boldly forward in defense of his non-juring principles, and subjected himself to repeated imprisonment, both for writings and other overt acts, which a more tyrannical government might easily have construed into treason. His political writings have almost been forgotten; but he wrote two other works, which have preserved his name, and prove him to have been a writer of distinguished ability. The one entitled 'Essays Upon Several Moral Subjects' (1697) is distinguished by learning and wit, and an easy flowing style; the other, entitled 'Short View of the

Immorality and Profaneness of the English Stage' (1698), is unquestionably a masterpiece, and is still perhaps the best work written on the subject. It enjoyed great popularity notwithstanding the fierce opposition it encountered especially from Congreve and Vanbrugh, and is said to have had the effect of greatly purifying both the sentiments and the language of the theatre. The only other work of Collier deserving of special notice is his 'Ecclesiastical History of Great Britain to the End of the Reign of Charles II' (1708 and 1714). It cost him many years of labor and displays much ability, but is strongly tinctured with his non-juring views. In 1713 he was consecrated bishop among the non-jurors. Consult 'The Ecclesiastical History,' edited by Lathbury (London 1852).

COLLIER, John Payne, Shakespearean critic: b. London, 11 Jan. 1789; d. Maidenhead, 17 Sept. 1883. He wrote many critical articles in periodicals, published in 1820 his 'Poetical Decameron,' and thenceforward continued his editions of poems and plays, notably those of the less-known Elizabethan writers. His best work, 'History of English Dramatic Poetry' appeared in 1831. He took great interest in and edited many publications for the Camden, Percy and Shakespeare societies, and completed in 1844 an eight-volume edition of Shakespeare. In 1852 he professed to have discovered, on the margins of a copy of the second folio Shakespeare, bought from a second-hand bookseller, manuscript notes and emendations written in a 17th century hand. When these notes and emendations were published they became the subject of eager discussion by the critics, the best of whom were not disposed to set a high value on them, and in 1859 an examination of the volume convinced the British Museum authorities that the marginal notes were forgeries. Collier published a weak and inconclusive reply, in which he maintained their genuineness, and thenceforward he maintained complete silence on the matter. He continued to produce editions of English writers, among them Spenser (1862), and also critical and autobiographical works. Of his later publications the next most important is 'An Old Man's Diary' (1872). Among his papers were found indisputable proofs of a long series of literary forgeries. As a consequence suspicion has rested on all his work, and has obscured the real services he indisputably did to English literature. For a list of Collier's forgeries and the bibliography on the controversy, consult Lee, 'Life of Shakespeare' (3d ed., London 1900); Warner, 'Catalogue of MSS. of Dulwich College' (ib. 1881), and Ingleby, C. M., 'Complete View of the Shakespeare Controversy' (1861).

COLLIER, Robert Joseph, American publisher: b. New York, 17 June 1876. He was graduated at Georgetown University in 1894, and afterward spent one year each at Harvard and Oxford universities. He became associated with his father, Peter F. Collier, in the latter's publishing business, and after the latter's death in 1909 became head of the firm of P. F. Collier and Son, publishers of *Collier's Weekly,* of which he is editor. He initiated the Lincoln Farm Association, which raised, by popular subscription, funds for purchase of the old Lincoln farm in Kentucky and erected a granite memorial at the log-cabin where Lincoln was born. He is a member of the New York Municipal Art Commission, of the Metropolitan Museum of Art and the American Museum of Natural History.

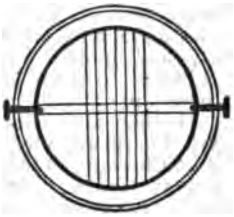
COLLIER, William, American actor: b. 1868. He made his début in a children's company in 1879. He was a member of Augustin Daly's company in 1883–88. He starred in 'On the Quiet' in 1901–02, and 'The Dictator,' in which he achieved a great London success in 1905, and in which he toured Australia the following year. His later appearances were in 'A Lucky Star' (1909); 'Bunty Pulls the Strings' (1912–13); 'A Little Water on the Side' (1914). He is part author of the following plays in which he also played rôles: 'I'll be Hanged if I Do' (1910); 'Take My Advice' (1911); 'Never Say Die' (1912). He is sole author of 'Caught in the Rain' (1906) and 'The Patriot' (1908). He has become widely known as a comedian.

COLLIER, William Miller, American diplomat: b. Lodi, N. Y., 11 Nov. 1867. He was graduated at Hamilton College in 1889, spent one year in the Columbia College Law School and was admitted to the bar in 1892. He was referee in bankruptcy for the Northern District of New York in 1898, was president of the New York State Civil Service Commission 1899–1903 and lecturer on the law of bankruptcy at the New York Law School 1903–05. In 1904 he was appointed special assistant attorney-general of the United States Department of Commerce and Labor. From 1905 to 1909 he was United States Minister to Spain. In the latter year he became general legal counsel and diplomatic agent for various American corporations in Europe, with offices at Auburn, N. Y., and Paris, France. He is author of 'Collier on Bankruptcy' (1898); 'Collier's Annotated Rules in Bankruptcy' (1899); 'Collier on Civil Service Law' (1901); 'The Trusts' (1900); 'At the Court of His Catholic Majesty' (1911).

COLLIMATION, Line of. In a measuring telescope there is placed at the focus of the eyepiece a system of spider-threads. In a transit instrument there are several vertical and two horizontal «wires,» as shown in the diagram.

In spite of numerous experiments in a search for something more durable than spider threads, «wires» are still almost universally formed of this fragile material. Quartz fibre and finely drawn platinum wire have at times been employed, but it is found that the fineness and evenness of threads from chosen varieties of spiders exceeds anything that can be produced by artificial means. In smaller instruments the wires are frequently fine lines drawn on a glass plate.

In taking an observation the time at which the star passes behind each wire is noted. Taking the mean of these times, we obtain what is called the time for the «mean wire,» an imaginary wire which would, if the adjustments were perfect, coincide with the middle vertical wire. The mean of these observations gives a better result than if only one central wire were used. The line of collimation is defined to be the straight line that joins the centre of the object-glass with the point of this imaginary vertical wire midway between the two horizontal wires. A definition similar to that here given applies in other cases, in the case of the mural circle, for example, and in the case of instruments for terrestrial surveying. The proper adjustment of the line of collimation of these instruments is one of the most important of the adjustments.



Spider-lines

In the case of the transit instrument, for instance, in observing the passage of a star, what is noted is practically the instant, according to the observatory clock, when the line joining the star and its image coincides with the line of collimation. The following is one of the conditions to be satisfied when the instrument is in perfect adjustment. The line of collimation must be perpendicular to the geometrical axis on which the telescope revolves, and will then describe a great circle. The framework that carries the spider-lines admits of several small movements for their adjustment. After the adjustment has been carefully made, however, there always remains a slight error, which is determined and allowed for in calculations under the name of the collimation error. Adjustments and corrections are similarly made in the other telescopes for measuring.

When the central wire has been fully adjusted and placed in the meridian by the observation of stars, it is usual with larger instruments to facilitate its future adjustment by the use of *Collimators.* These are telescopes mounted horizontally on piers, one north and one south of the instrument, and so arranged that when the latter is horizontal it will point directly into one of the collimator telescopes, which are made of the same aperture as that of the instrument itself. At the focus of each lens a spider thread is placed, which is thus viewed through the collimator exactly as if it were at an infinite distance away. Having adjusted the collimator threads in the meridian, the middle thread of the instrument can at any future time be placed upon them in a few seconds, thus saving a great deal of time. Sometimes the collimator lenses are made of a very long focus, even so great as a few hundred feet. The wires, or artificial stars, are then placed upon piers in so-called *Collimator Houses,* or *Mire Houses,* one north and one south of the meridian house, and a few hundred feet distant from it.

COLLIN, Louis Joseph Raphael, loo-ē zhō-zĕf rä-fä-ĕl kŏl-lăṅ, French figure and portrait painter: b. Paris 1850; d. there, 21 Oct. 1916. He studied under Bouguereau and Cabanel, obtained a second-class medal in the Paris Salon in 1873 and the medal of the Legion of Honor in 1884. In 1902 he was appointed professor at the Ecole des Beaux-Arts. He is perhaps best known for such works as the decorations in the Sorbonne and the ceilings of the Odéon and the Opéra Comique, Paris. He also decorated several ceilings in the United States. The most noted of his easel pictures are those of nudes in the open air, such as an 'Idyll' (Arras); 'Daphne and Chloe' (Alençon); 'Floral' (Luxembourg 1886); 'Eveil et Primerose' (Bucharest 1894), and many others in private collections, including the Anderson collection, New York. He was also a portrait painter, illustrator and painter on faïence. His work is in the classical style of his masters, Bouguereau and Cabanel.

COLLIN D'HARLEVILLE, därl-vēl, **Jean François,** French dramatist: b. Mévoisins, near Maintenon, 30 May 1755; d. 24 Feb. 1806. He studied law but soon abandoned this field to devote himself to literature. He worked a genuine vein of comedy, yet never slighted the moral side of conduct, and some of his plays still keep the stage. Notable among his works are 'The Old Bachelor,' his masterpiece (1793); and 'Castles in Spain' (1806); 'L'Inconstant' (1780); 'L'Optimiste' (1788); 'M. de Crac dans son petit castel' (1791). He was an original member of the Institute. His theatrical works were edited by Moland (1876) and Thierry (1882). Consult Andrieux' memoir of Collin in his complete edition of the latter (Paris 1822).

COLLINGSWOOD, N. J., borough in Camden County, on Cooper River and on the Pennsylvania Railroad, adjoining Camden. It is well laid out and well built, has few industries, except manufactories of wall paper and wagons, but does a large trade in the agricultural products of the surrounding district. Pop. 4,795.

COLLINGWOOD, Cuthbert, Lord, English admiral: b. Newcastle-upon-Tyne, 26 Sept. 1750; d. at sea near Minorca, 7 March 1810. He entered the royal navy in 1761, gradually rose in service and became a close friend of Nelson. In 1799 he was made rear-admiral of the white. His most distinguished service was the part he bore in the great victory of Trafalgar, in which his gallant manner of bringing his ship, the *Royal Sovereign,* into action, and the skill and resolution with which he fought her, excited the personal admiration of Nelson himself, upon whose fall the command of the fleet devolved upon Collingwood as senior officer. He was promoted to be vice-admiral of the red, continued in his command of the fleet and was elevated to the peerage with the title of Baron Collingwood. A monument has been erected to him at Tynemouth. His 'Memoirs and Correspondence' was published by his son-in-law (2 vols., 1828).

COLLINGWOOD, William Gershom, English writer and artist: b. 1854. He was educated at Liverpool College and University College, Oxford. He first exhibited at the Royal Academy in 1880, while from 1881 to 1890 he was secretary to John Ruskin. He has published 'Life of Ruskin'; 'Thorstein of the Mere'; 'The Bondwoman'; 'Coniston Tales'; 'The Lake Counties'; 'Scandinavian Britain,' etc.

COLLINGWOOD, Canada, port of entry and county-seat of Simcoe County, Ontario, on Georgian Bay, Lake Huron and the Grand Trunk Railway, 95 miles northwest of Toronto. It is an important commercial port, the terminus of steamship lines to Owen Sound, Sault Sainte Marie, Fort William, Duluth and other ports of the Great Lakes, and has a large trade in lumber, grain, produce, iron ore, etc. It is the seat of a United States consulate. It has tanneries, breweries, flour mills, sash, blind and pump factories, and is lighted by gas and electricity. Pop. 7,090.

COLLINS, Anthony, English theologian: b. Heston, Middlesex, 21 June 1676; d. London, 13 Dec. 1729. He was educated at Eton and Cambridge, and devoted himself to general literature. During the years 1703–04 a correspondence was carried on between him and Locke who regarded him as having «as much of the love of truth for truth's sake as he had ever met with in anybody.» Among his numerous writings, all published anonymously, the one most commonly associated with his name is entitled a ‘Discourse on Freethinking.’ It attracted considerable notice at the time, and was answered, among others, by Bentley, under the assumed name of ***Phileleutherus Lipsiensis.*** Another work, entitled ‘Philosophical Inquiry Concerning Liberty and Necessity,’ was answered by Samuel Clarke. He also wrote ‘Essay Concerning the Use of Human Reason’ (1707); ‘Priestcraft in Perfection’ (1709); ‘Discourse of Freethinking’ (1713); ‘Historical and Critical Essays on the Thirty-Nine Articles’ (1724); ‘Defence of the Divine Attributes’ (1710); ‘Grounds and Reasons of the Christian Religion’ (1724); ‘Literal Scheme of Prophecy’; ‘A Letter to the Rev. Dr. Rogers on Occasion of His Eight Sermons on the Necessity of Revelation and the Truth of Christianity’ (1727). His benevolent and tolerant spirit gained the respect of many who widely differed from him on theological questions. Consult Stephens, ‘English Thought in the Eighteenth Century’ (1881).

COLLINS, Arthur, English theatre manager: b. London 1863. In 1881 he was apprenticed to a scenic artist, Henry Emden, at the Theatre Royal, Drury Lane. He was stage manager there in 1887–96 and in 1897 leased the Drury Lane and formed a managing company with himself as director. He produced ‘Hearts are Trumps’ (1899); ‘Ben Hur’ (1902); ‘The Prodigal Son’ (1905); ‘The Bondman’ (1906); ‘The Sins of Society’ (1907); ‘Marriages of Mayfair’ (1908); ‘The Whip’ (1909); ‘Everywoman’ (1912).

COLLINS, Frank Shipley, American botanist: b. Charlestown, Mass., 6 Feb. 1848. He was graduated at the Malden High School in 1863. He was engaged in commercial pursuits from 1864 to 1912. He has been a student of botany for many years and is a member of many botanical societies. He is the author of ‘Flora of Middlesex County’ (1888); «Green Algæ of North America» (in ‘Tufts College Studies,’ 1909); ‘Phyotheca Boreali Americana’ 1894–1913); and contributions to botanical journals.

COLLINS, John Churton, English author and educator: b. Bourton-on-the-Water, Gloucestershire, 26 March 1848; d. Lowestoft, England, 12 Sept. 1908. He was educated at King Edward's School, Birmingham, and Balliol College, Oxford, whence he was graduated in 1872. He engaged in journalism, education and in public lecturing, especially pleading, both in his writings and lectures, for the study of literature as distinct from philology. In 1904 he became professor of English literature at the University of Birmingham. Among his publications are ‘Bolingbroke’ and ‘Voltaire in England’ (1886); ‘Study of English Literature’ (1891); ‘Illustrations of Tennyson’ (1891); ‘Dean Swift, a Biographical and Critical Study’ (1893); ‘Essays and Studies’ (1895); ‘Ephemera Critica’ (1901); ‘Studies in Shakespeare’ (1904); ‘Studies in Poetry and Criticism’ (1905), etc. He has also edited ‘Plays and Poems of Cyril Tourneur’ (1878); ‘Poems of Lord Herbert of Cherburg’ (1881); ‘Plays and Poems of Robert Greene’ (1899); Dryden's ‘Satires’; Pope's ‘Essay on Criticism’; Tennyson's ‘Poems’ (1901); Tennyson's ‘In Memoriam, Maud and Princess’ (1902); More's ‘Utopia’ (1904); Matthew Arnold's ‘Merope’; ‘A Treasury of Minor British Poetry,’ etc., and is also general editor of the series ‘Shakespeare for Schools’ and ‘British Classics for Schools.’ In his works on Tennyson he revealed, in early English poets, some of the sources of his inspiration.

COLLINS, Joseph William, American ichthyologist: b. Isleboro, Me., 8 Aug. 1839; d. 1904. His boyhood was spent on fishing schooners and he was entirely self-taught. He made the statistical inquiry into New England fisheries for the 10th United States census, 1879–80, and for the United States Fish Commission, with which he remained connected until 1892. He was an official of the International Fisheries Expositions at Berlin, 1880; London, 1883; chief of the Fish and Fisheries Department at the Chicago World's Fair, 1893; and organized the section of Naval Architecture in the United States National Museum, and he was curator of the department for almost 10 years. He was a contributor to the ‘Century Dictionary’; edited the *Fishing Gazette,* 1893–94; and wrote many papers and reports on his specialty.

COLLINS, Mabel. See COOK, MABEL COLLINS.

COLLINS, Mortimer, English man of letters: b. Plymouth, England, 29 June 1827; d. Knowl Hill, 28 July 1876. His father, who was a solicitor, published a volume of verse and seems to have been a good mathematician. His mother was connected with the Mortimers of Dorset. While at school, the boy wrote verse and prose for local newspapers; and began to contribute to *Fraser's* and *Punch.* At the age of 22 he married, and settled at Guernsey as mathematical master of Queen Elizabeth's College. This position, which interfered with his literary work, he resigned in 1856, the year after the appearance of his first volume of poems, ‘Idyls and Rhymes.’ During the next 10 years he edited several provincial newspapers and contributed extensively to the London press. A strong Tory in politics, he was accounted one of the best at political squibs. His lyrics and epigrams in the *Owl* were especially well received. In 1860 appeared ‘Summer Songs’ and in 1865 his first novel, ‘Who is the Heir?’ By 1862 he was settled at Knowl Hill, Berkshire, some 30 miles from London, where he passed the rest of his life in unremitting industry. He wrote novels, reviews, sketches of travel and an enormous amount of verse. ‘The Marquis and the Merchant’ (1871) was regarded as his best novel. ‘The Secret of Long Life’ (1871), a collection of essays, including a notable one on laziness, ran through several editions. Collins was a «well-made man, over six feet in height, with a handsome face and well-shaped head.» Among his numerous friends were Edmund Yates and R. D. Blackmore. His first wife died in 1867. The next year he married Frances Cotton, who collaborated with him in fiction and published on her own account a novel called a ‘Broken Lily’ (1882). Consult ‘Mortimer Collins; His Letters and Friendships’ (2 vols., London 1877), a scrappy but interesting biography by his widow. To ‘Pen Sketches by a Vanished Hand from the Papers of the Late Mortimer Collins’ (London 1879) Tom Taylor prefixed a memoir. For some of his best pieces, consult also ‘Thoughts in my Garden’ (London 1885), collected and edited by E. Yates, and ‘Attic Salt’ (1880), a selection of Collins’s epigrams, by F. Kerslake.

WILBUR L. CROSS,
Professor of English, Yale University.

COLLINS, Thomas Wharton, American jurist: b. New Orleans, La., 23 June 1812; d. 3 Nov. 1879. He became a printer, then an editor, studied law, was admitted to the bar in 1833, was reporter and clerk of the State senate in 1834, then edited the *True American,* was clerk of the United States Court in 1836–38, district attorney for the Orleans district in 1840–42, judge of the City Court in 1842–46, a member of the Constitutional Convention in 1852, and in 1856 was elected judge of the first District Court of New Orleans. At the close of the war he resumed the practice of law in New Orleans, and in 1867 was made judge of the seventh District Court, which office he held until the court was abolished when he returned to legal practice. He was the author of a tragedy called ‘The Martyr Patriots,’ which was successfully performed; also of ‘Humanics’ (1860); ‘The Eden of Labor’; and essays on sociology, ethics and politics, published in periodicals.

COLLINS, William, English poet: b. Chichester, England, 25 Dec. 1721; d. there, 12 June 1759. He was educated at Winchester school and at Oxford where he was noted for «genius and indolence,» and where he was graduated in 1743. While at college he wrote his ‘Persian Eclogues,’ printed in 1742. Their success was moderate, and in 1744 the author went to London as a literary adventurer. In 1746 he gave his ‘Odes, Descriptive and Allegorical,’ to the public; but the sale did not pay for the printing, and the poet burned all the unsold copies. These he was enabled to buy back from the publisher, Millar, through the generosity of an uncle who bequeathed him a small legacy. They were never widely read and their musical verse, lyric fervor and exquisite imagery remained unappreciated by the public for many years. Yet among these odes were many pieces which at present rank with the finest lyrics in the language. His head was always full of schemes, though few of them matured with any degree of success to him, and finding it more difficult to win fame than he had anticipated, he soon became dissipated and extravagant, and exhausted his slender means. During these times he planned works entirely beyond his power of execution, and even advertised one, ‘Proposals for a History of the Revival of Learning,’ but did not write it. He subsequently began several tragedies; but his indolence and irresolution retarded his progress, and the tragedies rarely advanced beyond the preliminary stage of devising the plot. Constantly in debt and in fear of the bailiff, he finally persuaded a bookseller to advance money to leave London, in return for which he was to translate Aristotle’s ‘Poetics’ and write a commentary, but he probably did not fulfil his agreement. Collins was always weak in body, and when still a young man was affected by a mental disease. Originally too laxly strung, his nervous system was disorganized by disappointment, distress and irregularity. Months of despondency were followed by periods of madness until he was finally taken to Chichester and cared for by a sister. His best known poems are ‘The Ode on the Passions,’ those to Mercy and Evening, ‘The Dirge in Cymbeline’ and the famous ‘How Sleep the Brave.’ His odes are now almost universally regarded as among the best productions of the kind in English for vigor of conception, boldness and variety of personification and genuine warmth of feeling. Of his ‘Ode to the Evening’ Hazlitt has said that «the sounds steal slowly over the ear like the gradual coming on of evening itself.» Swinburne said, in speaking of the ‘Ode to the Passions,’ «Its grace and vigor, its vivid and pliant dexterity of touch, are worthy of their long inheritance of praise.» He occupies a midway position between Gray and Wordsworth. His ‘Works’ have been edited by J. Langhorne (1765), Mrs. Barbauld (1797), A. Dyce (1827), etc., and his ‘Poems’ by Bronson (Boston 1898) and Stone (Oxford 1907). Consult also Johnson’s ‘Lives of the Poets’ (Oxford 1781); and Beers, ‘English Romance in the 18th Century’ (New York 1899).

COLLINS, William, English painter of landscapes and domestic scenes: b. London, 8 Sept. 1788; d. there, 17 Feb. 1847. His picture of the ‘Young Fifer,’ exhibited in 1811, was purchased for 80 guineas, and in 1813 he at once raised himself to a position of eminence by his ‘Sale of the Pet Lamb,’ so well known by engravings. In 1820 he was elected a Royal Academician. For his picture of the ‘Fisherman’s Departure,’ painted in 1826, he received 350 guineas. Other noted works of his are ‘Rustic Hospitality’; ‘Sunday Morning,’ and ‘Happy as a King.’ Two sacred pictures, ‘Our Saviour with the Doctors in the Temple’ and ‘The Two Disciples at Emmaus,’ were exhibited in 1840 and 1841, but were unsuccessful. He visited Italy 1836–38; also visiting the Shetland Isles (1842) and illustrating Scott’s novel ‘The Pirate.’ He was the father of Wilkie Collins, the novelist, whose memoir of his father was published in 1848.

COLLINS, SIR William Job, English surgeon: b. London, 9 May 1859. His medical training was obtained at Saint Bartholomew’s Hospital, London, and he has since held various professional positions of importance. He was elected to the London County Council for West Saint Pancras in 1892, 1895, 1898, 1901 and 1904, and contested that electorate for Parliament 1895 and the University of London in 1900. He has published ‘Specificity and Evolution in Disease’ (1884); ‘Pathology of Cataract’ (1897); ‘Spinoza’ (1889); ‘Rationalism in Medicine’ (1890); ‘The Man *v.* the Microbe’ (1903); ‘Physic and Metaphysic’ (1905); ‘Sir Samuel Romilly’s Life and Work’ (1908); ‘The Chadwick School of Thought’ (1913); ‘The Etiology of the European Conflagration’ (1915), etc. He was created K.C.V.O. in 1914.

COLLINS, William Wilkie, English novelist: b. London, 8 Jan. 1824; d. there, 23 Sept. 1889. The eldest son of William Collins (q.v.), the landscape and portrait painter, he also bore the name of David Wilkie, the distinguished academician. Among his friends and in letters he was always known as Wilkie Collins. Educated privately, he passed two years (1836–38) with his father in Italy, where he became greatly interested in Italian art, scenery and history. In 1841 he obtained a clerkship in a London firm of tea-merchants with a view to a business career. After five years of this, he began the study of law, and was called to the bar in 1851. While thus hesitating between law and business, he had shown for some time a bent toward art and literature. For landscape especially he possessed talent. His first book to be printed was a memoir (1848) of his father, who died in 1847; but he had written, long before this, ‘Antonina, or the Fall of Rome,’ an historical romance of the Bulwer-Lytton type. It was given to the public in 1850. The next year he published an account of a summer in southwest England under the title ‘Rambles beyond Railways.’ Both books were well received. He now met Dickens, and at once became a man of letters. Thereafter the two novelists lived on terms of the most delightful friendship. They frequently collaborated on novels, and Collins contributed largely to Dickens’s ‘Household Words’ and ‘All the Year Round.’ The new influence upon Collins — Dickens in place of Bulwer-Lytton — was at once manifest in ‘Basil’ (1852), which dealt realistically with contemporary life in London. From history his descent was quick to a clerk and a linendraper’s daughter. Then followed ‘Hide and Seek’ (1854), ‘The Dead Secret’ (1857) and numerous short stories like the clever series of ghost tales called ‘After Dark’ (1856). In this early work Collins sometimes displayed great skill in concentrating attention upon a dominant *motif* which engrossed the reader as well as himself. In his view, the novel was a twin sister of the drama. But he first discovered his extraordinary talent in ‘The Woman in White’ (1860), which nobody left unread. It was absolutely a new type, depending in no wise upon the interest in character nor in adventure or incident as such, but upon the adroit manipulation of incident for first concealing and then revealing a secret. Collins is the father of the detective story. His first great success was repeated in ‘The Moonstone’ (1868). In other novels of the period he usually molded his plot to a distinct didactic purpose. This is particularly true of ‘No Name’ (1862), ‘Armadale’ (1866), ‘Man and Wife’ (1870) and ‘The New Magdalen’ (1873), all of which are among the most interesting novels of their kind. In 1873–74, Collins visited the United States, where he gave readings from ‘The Frozen Deep’ and other stories which he had just written. Several of his novels, dramatized either by himself or by others, were popular on the stage both in England and in the United States. He was buried at Kensal Green. Notable appreciations of Collins have been written by Swinburne, ‘Studies in Prose and Poetry’ (London 1894); Quilter, *Contemporary Review* for April 1888; and Lang, *Contemporary Review* for January 1890.

Wilbur L. Cross,
Professor of English, Yale University.

COLLINSVILLE, Ill., city in Madison County, 10 miles east of East Saint Louis, on the Vandalia Railroad. It contains a hospital and a tuberculosis colony. It is a busy coal-mining centre and has zinc works, lead smelters and knitting and flour mills. Collinsville was settled in 1800 and incorporated in 1830. The government, under charter of 1872, is vested in a mayor, chosen for two years, and a council of one chamber. The city owns its waterworks. Pop. 7,478.

COLLISION, in navigation, the shock of two ships coming into violent contact, whereby one or both may suffer more or less injury. Of 104 major shipping disasters over the past half century, 24 occurred through collision, with a total loss of 6,615 lives, or 23 per cent of shipping disasters and over 23 per cent of lives lost. In order to avoid accident, it is the practice of the great transatlantic lines trading between England and America to choose each definite lanes of travel, which are rigidly adhered to. The American rules in regard to the prevention of collisions are based upon the same principles as the English, with which they are substantially identical. The leading doctrines of English law on this subject are thus stated by Lord Stowell: «In the first place, collision may happen without blame being imputable to either party, as where the loss is occasioned by a storm or any other *vis major*, in which case the misfortune must be borne by the party on whom it happens to light. Secondly, a misfortune of this kind may arise where both parties are to blame — where there has been a want of due diligence or skill on both sides; in such case the loss must be apportioned between them, as having been occasioned by the fault of both of them. Thirdly, it may happen by the misconduct of the suffering party only, and then the rule is that the sufferer must bear his own burden. Lastly, it may have been the fault of the ship which ran the other down, and in that case the injured party would be entitled to an entire compensation from the other. In a court of common law the same rule holds in the first, third and fourth cases; but in the second (where both parties are to blame) the rule is, that if the negligence of both substantially contributed to the mishap, neither has an action against the other; but if one of them, by exercising ordinary care, might have avoided the consequence of the other’s negligence, the former is liable for any injury sustained by the latter.» In pursuance of the Merchant Shipping Amendment Act (1862), orders were issued in 1863, 1879, 1884 and 1885, giving regulations for preventing collisions. These contain rules concerning lights and fog-signals, and sailing and steering rules. With respect to lights it is enacted that steamers shall, when under way, carry a white mast-head light, on the starboard side a green and on the port a red light; when towing other vessels they must carry two mast-head lights, placed vertically. Sailing vessels shall carry only the side lights; fishing and other open boats are not required to carry side lights, but may use a lantern with a red slide on the one side and a green slide on the other, and such lantern must be exhibited in sufficient time to prevent collision, and so that the green light shall not be seen on the port side nor the red light on the starboard side. Ships at anchor in a roadstead must exhibit a white light where it can be seen, not more than 20 feet above the hull, in a globular lantern eight inches in diameter, showing at a distance of a mile all round. The sailing and steering rules demand that if two sailing ships are approaching each other end on, or nearly so, the helms of both must be put to port, so that each may pass on the port side of the other; in crossing so as to involve risk of collision the sailing ship with the wind on the port side shall keep out of the way of the ship with the wind on the starboard, but if they have both the wind on the same side the ship which is to windward shall keep out of the way of the one that has it to leeward. If a steamship and a sailing ship are approaching so as to involve collision, the former must keep out of the way of the latter. The rules for two steamships passing or crossing are nearly the same as for sailing ships. If one vessel is overtaking another she must keep out of the way of the last-named vessel. When, according to the rules, one of the ships keeps out of the other's way, that other shall generally be understood to keep her course. See Navigation Laws; Rules of the Road.

COLLITZ, Hermann, American philologist: b. Bleckede, Hanover, 4 Feb. 1855. He was educated at Lüneburg, Göttingen and Berlin. In 1883–86 he was assistant librarian, and in 1885–86 instructor in Sanskrit and comparative philology, at the University of Halle. In 1886 he became associate professor of German, and in 1897 professor of comparative philology and German, at Bryn Mawr. In 1907 he was appointed professor of Germanic philology at Johns Hopkins University. His early work was principally in the field of comparative philology in general and in the Greek dialects; his later work has been mostly confined to German philology. His works include ‘Die Verwandtschaftsverhältnisse der griechischen Dialekte’ (1885); ‘Die neueste Sprachforschung’ (1886); ‘Das schwache Präteritum und seine Vorgeschichte’ (1912). He is editor of ‘Sammlung der griechischen Dialektenschriften’ (4 vols., 1884–1915); ‘Bauers Waldeck Dialect Dictionary’ (Leipzig 1902); ‘Hesperia’ (1912–15); coeditor of *Modern Language Notes* (1902–13). He is a frequent contributor to philological journals.

COLLITZ, Klara Hechtenburg, American philologist: b. Rheydt, Rhenish Prussia, 1863. She was educated at Neuwied am Rhein, at Lausanne, London, Oxford and Heidelberg, specializing in languages. She married Hermann Collitz (q.v.) in 1904. In 1895–96 she was lecturer in French philology at Victoria College, Belfast, Ireland, in 1897–99 in charge of Germanic philology at Smith College, and lecturer in German philology for women students at Oxford in 1901–04. She is author of ‘Das Fremdwort bei Grimmelshausen’ (1901); ‘Der Briefstil im 17. Jahrhundert’ (1903); ‘Fremdwörterbuch des 17. Jahrhunderts’ (1904). She edited ‘Selections from Early German Literature’ (1910); ‘Selections from Classical German Literature’ (1914). She is also a frequent contributor to philological journals.

COLLODION (Gr. κολλώδης, «like glue»), a solution, in mixed alcohol and ether, of soluble pyroxylene (or «gun-cotton»). It is colorless and highly inflammable. The gun-cotton that is used in its manufacture is commonly prepared by the action of a mixture of nitric and sulphuric acids upon cotton-wool that has been first boiled in a solution of sodium carbonate (to remove all greasy and resinous matters) and afterward thoroughly washed and dried. The following procedure is followed in the subsequent operations: Three fluid ounces of strong nitric acid are poured slowly into two fluid ounces of water, and nine fluid ounces of strong sulphuric acid are added, stirring constantly. When the mixture has cooled to about 140° F., 100 grains of the prepared cotton-wool are added in tufts weighing about 10 grains each. At the end of 8 or 10 minutes the acid is poured off and the cotton is subjected to gentle pressure to expel the greater part of the fluid that its fibres have retained. The cotton is next thoroughly washed with water and a weak solution of sodium carbonate until the acid has been entirely eliminated, after which it is allowed to dry. The product is «soluble gun-cotton.» It does not differ materially, in appearance, from the original cotton; but if the operations to which it has been subjected have been correctly carried out, it will be found that the cotton has become soluble in a mixture of equal parts of alcohol and ether. Commercial collodion contains 100 to 120 grains of gun-cotton to 10 ounces of ether and 5 ounces of alcohol, a further 5 ounces of alcohol being added after the salts have been dissolved. Before the advent of the dry-plate process, collodion was greatly used in photography for the preparation of sensitive plates; and at the present day it is used to some extent in this way, especially in certain branches of photo-engraving. In the preparation of these plates the collodion is first iodized and brominized by the addition of the iodide and bromide of cadmium or of ammonium, or a mixture of both, and the addition of a few drops of nitric acid, and is then poured over a carefully cleansed glass plate. The volatile solvent evaporates rapidly, leaving a film of iodized gun-cotton upon the glass. Immediately before the exposure is made the coated plate is immersed in a solution of nitrate of silver, with the result that a deposit of iodide and bromide of silver, sensitive to light, is formed in the guncotton layer. The plate is next exposed in the camera, and afterward developed by a ferrous sulphate solution in water. Collodion is used in the place of adhesive plaster, in the case of trivial injuries, to afford protection from the air, and from pyogenic and other objectionable germs. When applied to the injured spot it quickly dries, leaving a tough, elastic coating which is impervious to moisture. It was first employed in surgery by Dr. J. Parker Maynard, of Boston, Mass., in 1847. In this application it is often medicated in various ways, one of the best-known examples being blistering collodion, which contains cantharides, and is applied to the skin for the purpose of producing a blister. Medicated collodion is also largely used in chiropody.

COLLOID CHEMISTRY had its beginning in the discovery by Thomas Graham in 1860–61 that aqueous solutions of various substances did not act in the same way when subjected to diffusion through parchment membranes such as used in osmosis experiments. He noted that in the case of substances which formed crystals when the water was evaporated from their solutions, the aqueous solution passed through the membrane unchanged; while in the case of substances which did not so crystallize, but formed amorphous solids, the water alone passed through the membrane, leaving the substance on the farther side, proving that these latter substances had not been in true solution, but in suspension. This discovery led Graham to divide all soluble substances into two classes: the crystalloids, like salt, sugar, alum, etc., and the colloids, like gelatine, gum arabic, raw albumen, etc. The conclusion reached by Graham was that the colloid molecules were constituted by grouping together the smaller crystalloid molecules, and that the difference in diffusibility was explainable on the relative size of the molecules.

For some years the newly opened field of research was not cultivated, but interest in Graham's discoveries was revived in 1900 by Hardy, who attempted a classification of the colloids into reversible and irreversible groups. Later, investigators made experimental inquiries as to the electrical constitution of the colloids, and the ultramicroscope confirmed the supposition that the colloids did not form true solutions, but mixtures. Since then researches have been many, particularly by the German scientists, and the development of the chemistry of the colloids has been rapid. The literature of this branch of chemistry now numbers hundreds of professional papers and several substantial volumes.

The practical applications of colloid chemistry have been many, particularly in the dyeing and tanning industries, the manufacture of soaps, casein and albumen products and gelatine photographic films; the study of enzymes, ferments and soils; the purification of drinking waters and of sewage; and in the investigation of many important bacterial and biological problems, such as the reactions of toxins and antitoxins, and the applications of immuno-chemistry. Consult Burton, E. F., ‘The Physical Properties of Colloid Solutions’ (London 1916); Stewart, A. W., ‘Chemistry and Its Borderland’ (London 1914); Taylor, W. W., ‘The Chemistry of the Colloids’ (New York 1915); Zsigmondy, R., ‘Colloids and the Ultramicroscope’ (Alexander's translation, New York 1909).

COLLOIDS (Gr. κολλώδης, «glue-like»), substances, such as albumen and silicic acid, which, when combined with water in certain proportions, exhibit a gelatinous consistency. The word does not imply that there is any chemical resemblance among the bodies to which it is applied, the distinction between colloids and non-colloids being wholly physical. The term «colloid» was proposed by Thomas Graham, in 1861, to designate substances that are practically incapable of diffusion through porous membranes. Substances such as salt, sugar and the mineral acids, which diffuse readily through such membranes, were called by him «crystalloids.» Colloids and their properties are of special interest to students of biology, since the cells of all living organisms are made up of a mixture of chemical substances known as protoplasm, the structure of which is due to colloids. As Matthews has said, «the cell is not a single room in which all of the chemical processes occur in a higgledy-piggledy manner, but is rather a well-organized chemical factory with different chemical processes occurring in different regions and in which substances are being elaborated as fast as they are required.» This division of labor is made possible by the colloidal nature of the protoplasm. This colloidal structure is due to the fact that the organic substances of which it is in part composed have very large molecules. They have little energy of translation and hence cohere. This colloidal nature of the products elaborated from the foods by the cell's chemical processes is what makes life possible. They are the true organizers of the cell's activities. Under the ultramicroscope one may see some of the colloidal particles dancing in the peculiar way known as the Brownian movements. These colloidal particles are the bearers of electrical charges, the opposite electrical charge being in the water which lies around the colloidal particles. There are electro-negative and electro-positive colloids. They are usually very small, varying from 1 to 100 25,000ths of an inch in diameter. The metal colloids are all electro-negative, since they send out, in the presence of water, positive ion charges to the water. It is due to the electrical reactions taking place in colloidal substances that the phenomena of life are largely possible. Energy is thus transmuted and made available for the life processes. In this transforming process certain substances termed enzymes accelerate these electrical reactions and hence are essential to the life processes. Consult Matthews, ‘Physiological Chemistry’; Bayliss, ‘Principles of General Physiology.’

COLLOP MONDAY, the Monday after Quinquagesima Sunday and preceding Shrove Tuesday. It was so named because on that day the faithful ceased eating flesh meat or «collops.»

COLLOPHANITE (Gr. κόλλα, «glue» + φαίνειν, «to appear» = «glue-like»), a native amorphous phosphate of calcium, somewhat resembling opal in structure, and having the formula $Ca_3P_2O_8+H_2O$. It is found principally on the island of Sombrero, the phosphoric acid that it contains being derived from the guano deposits there. Collophanite is white or nearly so, with a specific gravity of 2.7 and a hardness of from 2 to 2.5. The name is given on account of the glue-like appearance of the mineral.

COLLOQUIES OF ERASMUS, The. The ‘Colloquies of Erasmus’ (*Erasmi Colloquia*) has probably been the focus for more bitter criticism than any book of its size ever published, and it is by far the best known work of its famous scholar-author, the only one generally read down to our time. It was condemned by the Sorbonne as dangerous to morals in 1526; Luther in his 'Table Talk' declared, "If I die, I will forbid my children to read his 'Colloquies'"; and Saint Ignatius of Loyola denounced it by name to his community. It was eventually placed on the Index by the Church. Yet its author was the dear personal friend of Sir Thomas More, as also of Pope Hadrian VI, like himself a native of the Low Countries, and before his death he was offered the cardinalate by Pope Paul III, one of the great reforming popes, refusing it for reasons of health.

The *Colloquia* is a bitter satire on religious and other abuses, in which good and evil are sadly confused, and one is as likely to come in for condemnation as the other. It is brilliant but cynical; it is extremely clever, but utterly unsympathetic toward the mental and spiritual limitations of human nature. Like most pure satire, it was calculated to do ever so much more evil through embitterment than good through correction. It was a typical example of destructive criticism. A reflection on human nature worthy of Rochefoucauld is that in spite of all this the book was popular from the very beginning, though even its author deprecated "the caprice of fortune" which had made, as he confessed quite candidly in later years, "a book full of foolish things, bad Latin and Solecisms" so much read.

The 'Colloquies' is one of the great humanistic contributions to the literature called out by the Reformation movement, and its vivid vigorous Latinity has made it the favorite handbook of many a teacher who utterly disliked its content. Erasmus wrote Latin not as a dead but as a living language. His satiric humor has done the rest. The 'Colloquies' remains one of the books that no educated man cares to confess that he does not know. As a mirror of the foolishness of mankind in many ways, it is too essentially true to nature ever to lack interest. While it satirizes man's credulity in matters religious, it does not fail to hold up for ridicule his over-anxious desire to make money which so often leads him into equally foolish credulity, and shows that the promise of the transmutation of base metal into gold catches his fancy and runs away with it just as does any other superstition. Psychic researches and spiritists are bitingly satirized. It is ever a commentary on the morning paper. Consult 'Erasmiana' (University of Geneva Press, Geneva, 1897–1901); Seebohm, 'The Oxford Reformers, John Colet, Erasmus and Thomas More' (London 1887). A number of editions of the 'Colloquies' in English have been issued in England and America. Bailey's translation is usually chosen.

James J. Walsh.

COLLOT D'HERBOIS, kō-lō dār-bwä, **Jean Marie**, French revolutionary leader: b. Paris 1750; d. Cayenne, South America, 8 Jan. 1796. He was an actor, who adopted the name of D'Herbois. On the breaking out of the French Revolution he zealously espoused the views of the ultra-party, and published his 'Almanach du Père Gérard,' which gave him much influence with the most violent revolutionists. After the events of 10 August he became a member of the municipal council of Paris, and a few days after the horrors of September was chosen deputy to the National Assembly. He afterward became an active leader of the Mountain against the Girondists. He was sent by Robespierre along with Fouché to Lyons, in 1793, with almost unlimited powers and was guilty of the most flagrant enormities. Declaring that he found the guillotine too tedious and formal, he introduced the method of executing wholesale by the sword and by discharges of musketry. On his return from Paris he became a determined opponent of Robespierre, and being chosen president of the convention (19 July 1794), contributed powerfully to his fall. A few weeks later his own downfall followed. On the motion of Merlin he was expelled from the assembly and banished to Cayenne. Consult Morse-Stephens, 'The French Revolution' (London 1891); and 'Statesmen and Orators of the French Revolution' (Oxford 1892).

COLLUSION, kŏl-lū'zhŏn (Lat. *collusio*, "a playing together in the sense of to defraud"), a secret agreement between opposing litigants to obtain a particular judicial decision on a preconcerted statement of facts, whether true or false, to the injury of a third party. Collusion, when proved to exist, nullifies the judgment obtained through it. The term is somewhat broad in meaning and generally includes cases where two parties get together to defraud another or to defeat the aims and provisions of the law. If a husband and wife, for instance, mutually agree to institute divorce proceedings without just cause, the law would consider their act as collusion.

COLLYER, kŏl'yėr, **Robert**, American clergyman: b. Keighley, Yorkshire, England 8 Dec. 1823; d. 30 Nov. 1912. He came to the United States in 1849, being then a Wesleyan preacher and a blacksmith. His license as a Methodist minister was revoked partly for his preaching against slavery. In 1859 he became a Unitarian, and preached some years in Chicago, where he founded Unity Church in 1860 and was its pastor in 1860–79. He was made pastor of the church of the Messiah, New York, in September 1879, and pastor emeritus in 1896. Included in his publications are 'Nature and Life' (1864); 'The Life That Now Is' (1871); 'The Simple Truth' (1878); 'A History of the Town and Parish of Ilkley' (England, 1886, written with Horsefall Turner); 'Talks to Young Men' (1888); 'Things New and Old' (1893); 'A Man in Earnest' and 'Clear Grit' (1914), a collection of lectures, addresses and poems, edited by J. Haynes Holmes. Consult Holmes, J. H., 'Life and Letters of Robert Collyer' (1917).

COLLYRIDIANS, kŏl-ĭ-rĭd'ĭ-ạnz (Gr. *kollyridia*, "little cakes"), a sect toward the close of the 4th century, so denominated from the little cakes which they offered to the Virgin Mary. The sect consisted chiefly of Arabian women, who, out of an extravagant devotion to the Virgin, met on a certain day of the year to celebrate a solemn feast and to render divine honors to her as to a goddess, eating the cakes which they offered in her name. It is said that the members of this sect were not native Arabs, but immigrants from Thrace and Scythia. While pagans they had been accustomed to offer similar cakes to Venus or Astarte.

COLMAN, Benjamin, American clergyman: b Boston, Mass., 19 Oct. 1673; d. there, 29 Aug. 1747. He graduated at Harvard in 1692, began preaching, sailed for England 1695, was captured by a French privateer, and after a short imprisonment reached England. He received ordination in London, and returned to take charge of the Brattle Street Church, Boston, remaining with that society until his death. He was for many years one of the leading clergymen of New England, exerting a strong influence on civil affairs that frequently drew censure upon him. He procured considerable benefactions for Harvard and Yale, and was offered, but declined, the presidency of the former, in 1724. His collected sermons were printed at Boston 1707–22, and his 'Life' was written by his son-in-law, Rev. E. Turell (1749).

COLMAN, George (THE ELDER), English dramatist: b. Florence 1732; d. London, 14 Aug. 1794. He wrote in 1760–61 the comedies of 'Polly Honeycomb' and the 'Jealous Wife.' 'The Clandestine Marriage' (1766) we owe to him and Garrick. This was left unfinished, and it has never been ascertained to which of the authors most credit is due for that admirable comedy. 'The Royal Merchant' (1767), the 'Oxonian in Town' (1767), and other pieces followed the foregoing. In 1777 he purchased the little theatre in the Haymarket and continued in the personal superintendence of it till the year 1790.

COLMAN, George (THE YOUNGER), English dramatist, son of the preceding b. London, 21 Oct. 1762; d. there, 17 Oct. 1836. He was educated at Westminster School, Christ Church College, Oxford, and Aberdeen University; was entered as a student in the Temple, but early abandoned legal studies for dramatic and general literature. He assisted his father as director of the Haymarket Theatre and succeeded him as its patentee. After selling his interest in the theatre he was appointed examiner of plays in 1824, the duties of which he performed with a severe, not to say ridiculous, purism, hardly to have been expected in a man who wrote with almost licentious freedom himself. Most of his dramas were well received, and some of them still keep the stage; as 'John Bull'; the 'Heir-at-law'; 'Poor Gentleman' and 'Love Laughs at Locksmiths.'

COLMAN, Norman J., American office holder: b. Richfield Springs, N. Y., 16 May 1827; d. 1911. He settled in Saint Louis, Mo., and adopted the legal profession. He served in the Union army during the Civil War as lieutenant-colonel of volunteers. In 1865 he established an agricultural paper, *Colman's Rural World,* which he continued to edit to the close of his life. In 1874 he was elected lieutenant-governor, and was Commissioner of Agriculture in President Cleveland's first administration 1885–89. Shortly before his term of office ended, Congress enacted the law raising the Department of Agriculture to the rank of an executive department, with its chief a Cabinet officer, 11 Feb. 1889.

COLMAN, Samuel, American artist: b. Portland, Me., 4 March 1832. He studied art for many years in Paris, Madrid, Dresden and London. He is a landscape painter, working both in oil and water colors. His principal pictures are 'The Ships of the Western Plains,' now in the possession of the Union League Club; 'The Spanish Peaks' and 'Moonrise in Venice' in the Metropolitan Museum of Art, and the 'Mosque of Side Bou Hac, Tlemcen Algeria' in the New York Library. He has traveled extensively in Europe, Africa, Mexico, California and the Canadian Rocky Mountains; was made an associate of the National Academy of Design in 1861, receiving a full membership in 1864. He was one of the founders and first president of the American Water Color Society, also one of the founders of the Society of American Artists. He has been engaged for many years in an investigation of polar force in relation to angular magnitude, beauty and proportional form. This has resulted in a book, 'Nature's Harmonic Unity' (1913). Consult his biography by Koehler, in *American Art Review* (1880), and Isham, 'History of American Painting' (1905).

COLMAR. See KOLMAR.

COLNE, kōln, England, municipal borough in the county of Lancaster, and 34½ miles north of Manchester by rail. The most remarkable edifice is the Piece Hall, in the Elizabethan style. The chief manufactures are cotton goods. Colne was one of the earliest seats of the woolen and cotton manufacture in England, but woolens — the trade in which goes back to the 14th century — are no longer made there. Limestone and slate are quarried in the neighborhood. It is a place of great antiquity at which important discoveries of Roman coins have been made. Pop. 25,689.

COLOCASIA. See COCCO.

COLOCOLO, kō-lō-kŏl'lō, a wildcat (*Felis colocolo*) found in Guiana and Chile. It is somewhat larger than the domestic cat, is whitish-gray in color, with elongated black markings on the back and sides. In appearance it is much like the ocelot of Mexico and Central America, which enters so largely into the mythology and legendary history of the native races of Mexico and Guatemala. One of the highest orders of knighthood and nobility among the Aztecs was named after this native tiger or ocelot, the hide of which the knight wore as his special insignia of knighthood. The colocolo's pelt was used along the northeastern coast of South America by warriors as a distinction of rank much as the ocelot was in Mexico. The Minitaris dressed themselves in the hide of a wolf when going into battle just as the Central American tribes dressed themselves in that of the ocelot.

COLOCYNTH, kŏl'ō-sĭnth, the fruit of *Citrullus colocynthis,* deprived of its rind. The plant, one of the *Cucurbitaceæ,* or melon family, is widely distributed over waste lands in Asia and Africa. It is also extensively cultivated. It is collected when the fruit is nearly ripe and peeled while fresh. The fruit subsequently contracts somewhat, is whitish in lustre and very porous and light. As found in the market colocynth occurs as light, yellowish white balls, from one to three inches in diameter, that are very porous and fragile. It contains a large number of whitish seeds in six compartments. On breaking, the fruit splits irregularly, although there may be a tendency to dehisce in threes. The active principles are a resin and a bitter glycoside, colocynthin ($C_{56}H_{84}O_{23}$ Walz). Colocynth is an active drastic purgative and is rarely administered alone because of its harsh action, but in small doses in combination with other drugs, it is widely used as a laxative and purge. The compound cathartic pill and the vegetable pill are the chief vehicles that contain colocynth. The compound extract, made of colocynth, aloes, scammony, soap and cardamom, is widely employed in other preparations. Colocynthin is recommended as a rectal cathartic in doses of one-eighth to one-half grain. Colocynth itself can be given in doses up to five grains.

COLOGNE, kō-lōn' (German, *Köln*), Germany, a strongly fortified city of Prussia, in the Rhine province, on the left bank of the Rhine. It stands upon the river in the form of a crescent, and is connected with Deutz, on the opposite side and forming part of it, by a bridge of boats and an iron bridge. Till recently it was surrounded by fortifications dating from the Middle Ages, but these have been cleared away, their site built upon and a wider circuit of works constructed. Until the middle of the 19th century a great part of the city bore the impress of the Middle Ages, the streets being dark, narrow and filthy; but now the municipality has paid great attention to the appearance and sanitary condition of the town generally by opening up thoroughfares, widening and paving the streets, etc.

Among the principal buildings are the townhouse, a remarkably fine Gothic building, partly of the 14th century; the Gürzenich (1441–52), a splendid Gothic building, used for public festivities, and also accommodating the exchange; the Tempelhaus, a fine Romanesque building of the 12th or 13th century, occupied as the Chamber of Commerce; the government buildings, courthouse, post-office, Imperial bank and railway station. But the object of greatest interest in the town is the cathedral, begun in 1248, one of the finest and purest Gothic monuments in Europe. It is in the form of a cross; its entire length is 490 feet; its breadth, 231 feet; the roof rests on 100 columns, of which the four centre ones are 30 feet in circumference. The choir was long the only part finished; it is 161 feet high, and, with its pillars, arches, chapels and its superb painted glass windows, presents one of the finest sights conceivable. In 1842 the completion of this magnificent edifice was begun, after designs by Zwirner; the works were vigorously prosecuted from that time onward, and were completed in 1880. The two western towers are each 511 feet high, and are among the highest edifices in the world. The other remarkable churches are those of Saint Peter, in which is an altar-piece of the crucifixion of that saint, by Rubens, who presented it to this church, in which he was baptized; Saint Mary, on the capitol, occupying the site of the capitol of the ancient Roman city, and dating from about the year 1000, with some good stained glass windows; the Apostles' church, in the Neumarkt, built about the year 1200, a perfect specimen of the Romanesque style, having a singularly elegant and picturesque exterior; the church of Saint Ursula, filled with the bones of the 11,000 British virgins, who, according to the legend, were destroyed here on their return to Britain, under the guidance of Saint Ursula; the church of the Jesuits, or Maria Himmelsfahrt, dating from 1636, overloaded with gorgeous decorations of marble sculpture, etc.; and Saint Gereon's which, like the church of Saint Ursula, is lined with bones, not, however, of virgins, but of the Theban legion of martyrs, slain, according to tradition, during the reign of Diocletian; this is one of the finest and oldest churches in the city.

The city contains several gymnasia and other high-class institutions; a technical school; an observatory and botanical garden; a normal school, a public library, a theatre, several hospitals, a school of design, a museum, etc. The manufactures are very extensive and varied, embracing sugar, chocolate, tobacco and cigars, glue, liqueurs, mineral waters, starch, vinegar, soap, candles, velvet, silk, woolen and cotton goods, India-rubber, and gutta-percha wares, machinery and metal goods, etc., and the celebrated eau de Cologne, of which there are a great many different manufacturers. Its commerce is considerable; it has a good port on the Rhine, and an extensive railway communication with the interior of Germany and with Belgium and Holland. It is the principal entrepôt of the corn, wine and oil trade on the river, and has active commercial relations with the Netherlands, Germany, Belgium and Switzerland.

Cologne is of ancient origin, and was originally called *Oppidum Ubiorum*, being the chief town of the Ubii, a German nation. The Romans made it a colony 51 A.D., and called it *Colonia Agrippina*. It was annexed to the German Empire in 870, and became one of the most powerful and wealthy cities of the Hanseatic league, its population then amounting to 150,000. As early as the 11th century Cologne carried on an extensive trade with foreign countries, including England, in the produce of the country — wine, corn, flour, malt, beer, etc. The arts and sciences also flourished, and its university was one of the most famous in Germany. Intestine divisions, and other causes, finally effected its ruin, and in 1792 it ceased to be a free city. It was taken by the French in 1794, ceded to them by the Treaty of Lunéville in 1801, and restored to Prussia in 1814. Duns Scotus died in Cologne in 1308, and was interred in the chapel of the Minorites; and Rubens was born here in 1577, in the same house in which Mary de Medici died, in 1642. Pop. 516,527. Consult Heldmann, 'Der Kölngau und die Civitas Kölu' (Halle 1900).

COLOGNE, Eau de. See EAU.

COLOGNE EARTH, a kind of ochre, of a transparent deep-brown color, especially valuable in water-color painting and distemper work. Unfortunately it is not very permanent in thin washes. In the paint trade it generally goes by the name of Vandyke brown. In oil it is a very slow drier and should be ground in strong boiled oil. It is an earthy variety of lignite or partially fossilized peat.

COLOGNE YELLOW, a pigment consisting of chromate of lead and sulphate of lead in varying proportions. It is prepared by precipitating a mixture of lead chromate and lead sulphate with a mixture of potassium bichromate and sulphuric acid. A cheaper form of much paler hue and less covering power is made by mixing finely powdered sulphate of lime into a solution of potassium chromate and precipitating with neutral acetate of lead.

COLOMB, kō-lōm', Sir **John Charles Ready**, English military writer: b. 1 May 1838; d. 27 May 1909. He was educated at the Royal Naval College and entered the Royal Marine Artillery in 1854, retiring in 1869 with the rank of captain. He was a member of Parliament for Bow and Bromley 1886–92, and for Great Yarmouth 1895–1906, and was created K.C.M.G. in 1888. He has published 'Protection of Commerce in War' (1867); 'Imperial Strategy' (1868); 'The Distribution of Our War Forces' (1869); 'Colonial Defense and Colonial Opinions' (1873); 'The Defense of Great and Greater Britain' (1879); 'Naval Intelligence and Protection of Commerce' (1881); 'The Use and Application of Marine Forces' (1883); 'Imperial Federation: Naval and Military' (1886); 'British Defense' (1900); 'British Dangers'; 'Our Ships, Colonies, and Commerce in War' (1902).

COLOMB, Philip Howard, British admiral: b. Galloway, Scotland, 1831; d. 1899. In 1846 he entered the navy and saw much service against Chinese pirates in 1848–51, in the Burmese war of 1852, the Arctic relief expedition of 1854, in the attack on Sveaborg 1855 and in the suppression of the slave trade 1868–70. He became rear-admiral in 1887 and vice-admiral in 1892. He perfected the system of flash signals adopted by the British navy in 1867 and revised the evolutions for steam warships. He made a particular study of maritime collisions and many of his recommendations were adopted in the code of marine regulations put forth by the Washington Conference of 1889. His book, 'Naval Warfare' (1891; 3d ed., 1900) showed the vast importance of the command of the sea, and had the same theme as the works of the American officer, A. T. Mahan. He also wrote 'Slave-Catching in the Indian Ocean' (1873) and 'Memoirs of Sir Astley Cooper Key' (1898).

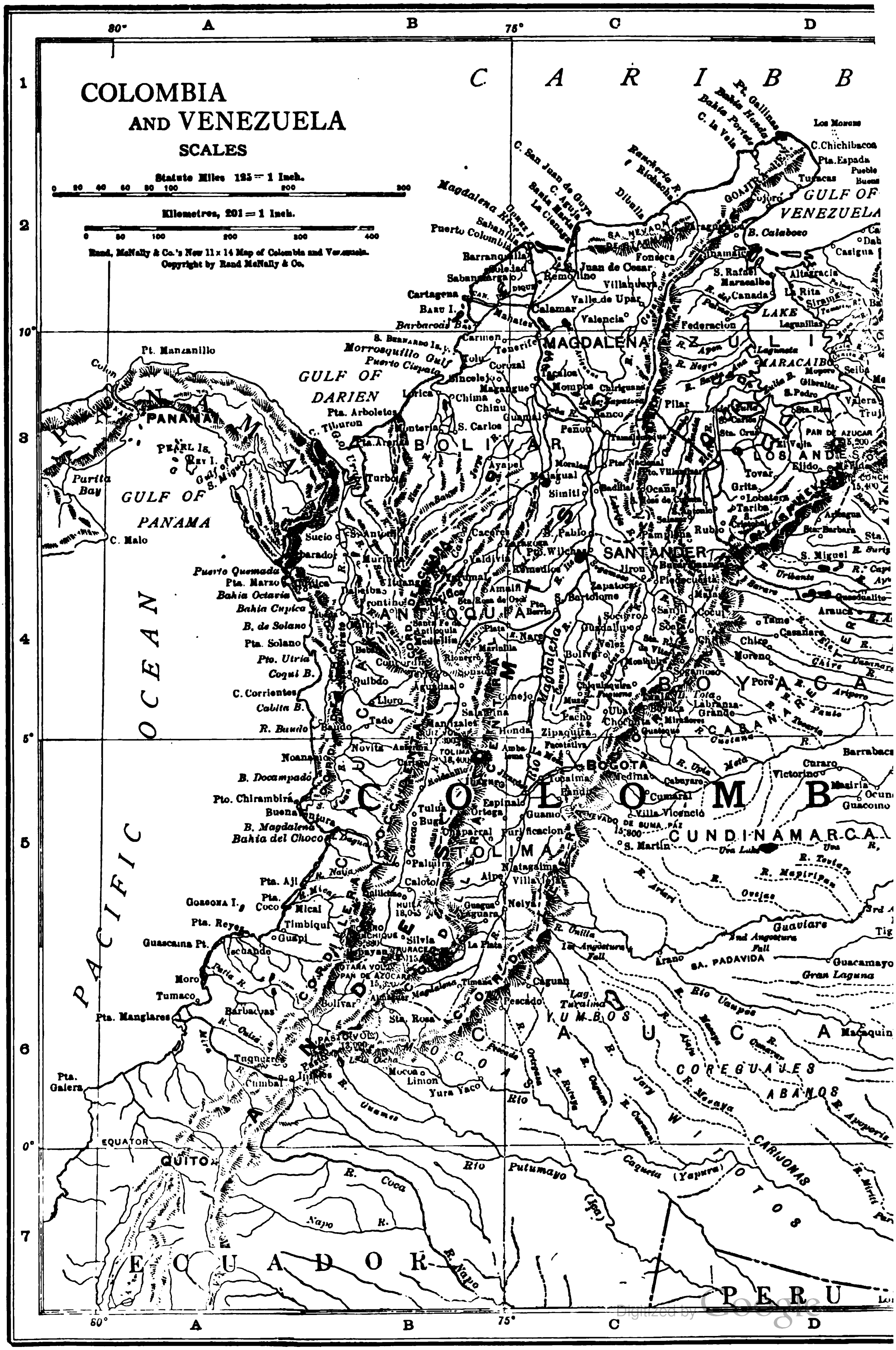
COLOMBA. This novel by Prosper Mérimée is one of the gems of French romantic literature, and is considered as the author's best work. It combines all the qualities of his other works, precision, skilful selection of the most expressive details and self-effacement of the author's personality; it has, besides, a glow of fiery passion intensified by its own restraint, but this may be due at least in part to the nature of the subject. Colomba is Corsica itself with its ideas and customs as rugged and savage as its shores and landscapes. Since the days of the Romans, the vendetta or law of revenge has remained the first law of the land and the basis of its ethical system. It is personified in the heroine, Colomba, whose thirst for revenge against those whom she believes responsible for her father's death overcomes the scruples of her brother, a young officer who had partly forgotten his native manners during a few years' residence on the Continent and in the army. A phlegmatic English colonel and his romantic daughter furnish the needed contrast to the intense Corsican girl and her more civilized brother. The careful handling of the plot, the dramatic situations in the story, the vivid touches of local color and a style combining strength and precision unite to make this short novel a literary masterpiece. There are a number of equally good translations of Colomba in English. Consult Taine in his preface to 'Letters to an Unknown'; and Sainte-Beuve, 'Portraits Contemporains,' (Vol. III).

Louis A. Loiseaux.

COLOMBES, kŏ'lônb', France, town in the department of the Seine, three miles northwest of Paris, of which it is a suburb. It has oil refineries and manufactories of woolens, oil, vinegar, gelatin, starch and surveying and measuring instruments. Pop. 22,862.

COLOMBIA. Physical Features, Flora and Fauna.— The republic of Colombia is bounded on the north and northwest by the Caribbean Sea and the republic of Panama; on the east by Venezuela and Brazil; on the south by Brazil, Peru and Ecuador; on the west by the Pacific Ocean. Its area cannot be stated precisely. The estimate in the latest census is 461,606 square miles; in the pamphlet entitled 'Latin America' (Washington 1915), 438,436. The boundary lines between it and four of the neighboring countries are in dispute.

The Andes of Colombia are divided into three ranges — the Cordillera Oriental, Cordillera Central and Cordillera Occidental — with intervening uplands of great extent, which are habitable and fertile, but as yet rather inaccessible. Of the three ranges mentioned, the Western Cordillera is the least impressive; the Central Cordillera has the greatest number of snow-clad summits. There are four river systems in the republic: (1) The western system, comprising the streams which flow from the western Cordillera into the Pacific Ocean; (2) the river Cauca and its affluents; (3) the Magdalena River with its affluents; (4) the streams of the eastern slope of the eastern Cordillera. Of special interest is the Atrato River, which is not included in any of the foregoing systems. This navigable stream flows to the Gulf of Darien near the disputed Panama-Colombia boundary. As Mr. Eder has written, when discussing the topography of this country. Colombia presents three main divisions for study, namely the coast regions, the low-lying eastern territory, and, between the two, the great Andean land, with its valleys, plateaux and mountains. The eastern region is subdivided into a northern part, where the *llanos* or open wild pastures are found, and «a southern part, of impenetrable forests, the *selvas* sparsely populated, except by savages, and much of it still but imperfectly explored.» Besides the three main Cordilleras, the other mountain systems of Colombia comprise the great mountain block called the Sierra Nevada of Santa Marta in the northern part of the country near the Caribbean Sea; far to the south a line of worn-down ancient mountains separating the Amazon basin from the Orinoco system; and the Baudo Range which runs along by the Pacific Coast from the mouth of the San Juan River to the Isthmus of Panama, and belongs to the Antillean system (See Central America), while the true Western Cordillera of the Andes, running northward a little farther from the Pacific Coast, is separated from the Baudo Mountains by valleys through one of which the San Juan River flows into the Pacific while in the other the Atrato takes its course toward the Atlantic. On the Pacific slopes of



Rand, McNally & Co.'s New 11 x 14 Map of Colombia and Venezuela.
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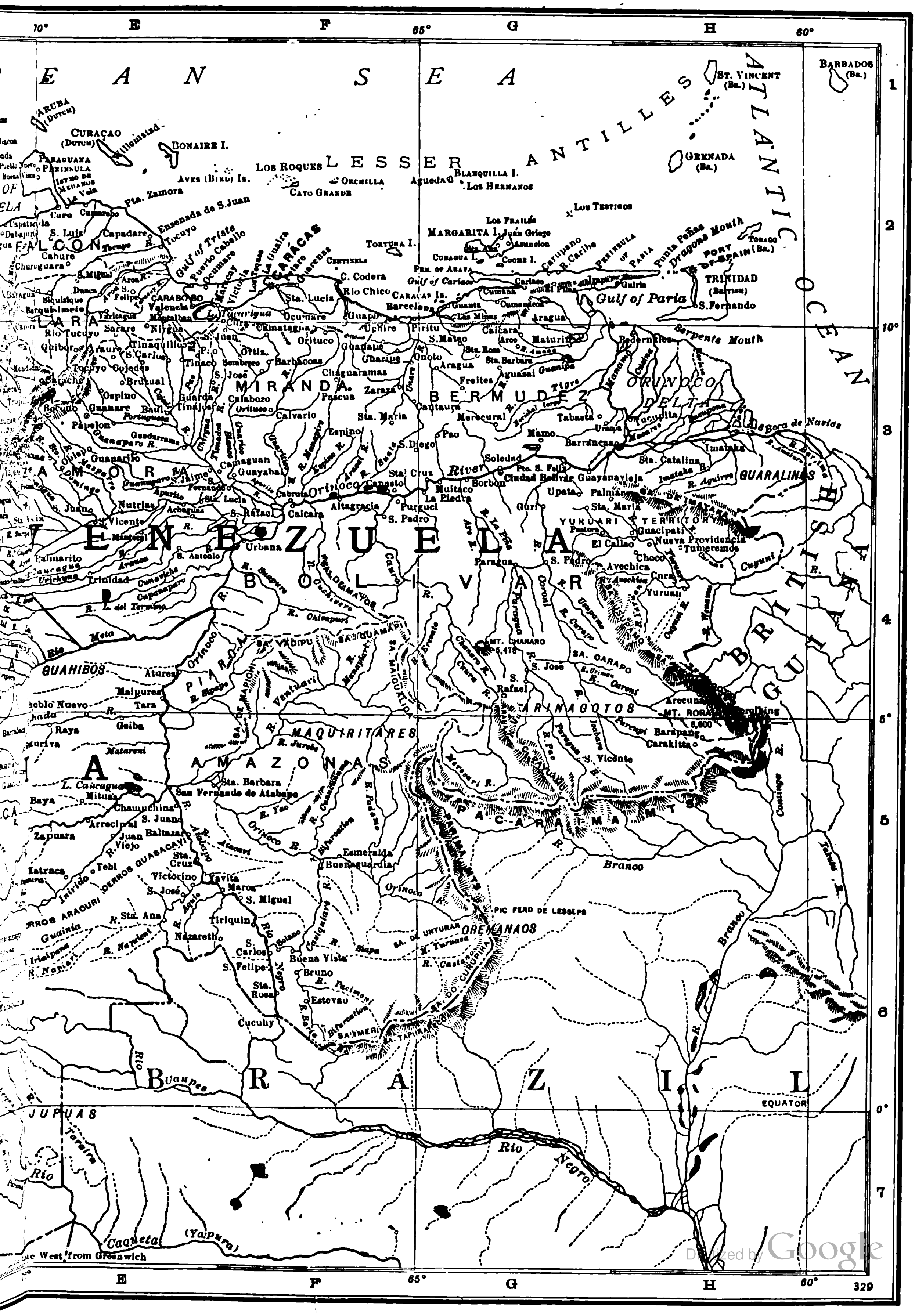
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LESSER ANTILLES
ATLANTIC OCEAN
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ST. VINCENT (Br.)
GRENADA (Br.)
TOBAGO (Br.)
TRINIDAD (British)
PORT OF SPAIN
S.Fernando
Dragons Mouth
Serpents Mouth
Gulf of Paria
ARUBA (Dutch)
CURAÇAO (Dutch)
Willemstad
BONAIRE I.
AVES (BIRD) Is.
LOS ROQUES
ORCHILLA
CAYO GRANDE
Aguedad
BLANQUILLA I.
LOS HERMANOS
LOS TESTIGOS
LOS FRAILES
MARGARITA I.
Juan Griego
Asuncion
TORTUGA I.
CENTINELA
C. Codera
Rio Chico
Gulf of Cariaco
Cumana
Carupano
Barcelona
Paraguana Peninsula
Pta. Zamora
Ensenada de S.Juan
Gulf of Triste
Puerto Cabello
La Guaira
CARACAS
FALCON
Coro
Tocuyo
LARA
Barquisimeto
CARABOBO
Valencia
L. Tacarigua
MIRANDA
Calabozo
BERMUDEZ
ORINOCO DELTA
Maturin
Tucupita
Boca de Navios
Imataka
GUARALINAS
ZAMORA
Cantaura
Soledad
Ciudad Bolivar
Caicara
Orinoco River
Upata
Guri
Guasipati
Nueva Providencia
Tumeremo
El Callao
YURUARI TERRITORY
VENEZUELA
BOLIVAR
SA. DE MAYOS
Urbana
S. Antonio
Trinidad
R. Meta
GUAHIBOS
Atures
PIAROA
Maipures
SA. GUAMAPI
SA. MAIGUALIDA
MT. CHANARO 5,478
SA. CARAPO
ARINAGOTOS
MT. RORAIMA 8,600
Barapang
Carakitta
MAQUIRITARES
AMAZONAS
S. Vicente
PACARAIMA MTS.
San Fernando de Atabapo
Sta. Barbara
Esmeralda
Buenaguardia
PARIMA MTS.
PIC FERD DE LESSEPS
OREMANAOS
SA. DE UNTURAN
SA. DO CURUPIRA
SA. TAPIRAPECO
Cucuhy
S. Carlos
Sta. Rosa
Branco
BRITISH GUIANA
Cuyuni
Cotingo R.
Takutu R.
Rio Negro
Rio Uaupes
BRAZIL
EQUATOR
JUPUAS
Caqueta (Yapura)
Rio Tarairá
R. Guaviare
Inirida
CERROS GUASACAVI
CERROS ARACUARI
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the Western Cordillera the rainfall is excessive and the vegetation is luxuriant, while the eastern slopes are comparatively arid. Near the border of Ecuador are the twin snow peaks, Chiles (16,912 feet) and Cumbal (17,076 feet). With these exceptions the height of the Western Cordillera is in general not above 12,000 feet; and on the other hand it is as a rule not below 6,000. There are, however, a few low passes, the most remarkable of which is the valley of the Patia, a precipitous gorge 1,676 feet deep. Here the Patia River has forced its way through the Andes and empties into the Pacific. Near the southern end of the continent there are other examples of rivers cutting the Cordillera from east to west, rather than from west to east; nevertheless the gorge of the Patia is decidedly noteworthy, and it will be referred to later. The Central Cordillera's high plateaux, in the regions of Pasto and Popayán, are well adapted to agriculture, and towns of some importance are located there, at no great distance from groups of volcanoes, some of which are «perpetually emitting smoky clouds from their snowy caps.» Dominating Cauca Valley, north of Popayán, is one of the highest mountains in Colombia, Huila (17,700 feet). Thence northward the Central Cordillera has a nearly constant altitude of about 12,000 feet. There are several passes, but through none have roads been built north of the pass near Popayán till near Quindiu. For the bulk of travel and traffic between the Cauca and Magdalena valleys, there is still available only the old Spanish highway. Near the Quindiu are the snow-crowned Tolima (18,400 feet), Ruiz and Herveo (18,300 feet), and Santa Isabel (16,700 feet). North of these high mountains, the Central Cordillera, widens out and here we find the important mineral region of Antioquia. The Eastern Cordillera (of Cretaceous and Tertiary formation), which broadens out into the great tableland or savannah of Bogotá, also has high peaks, such as those of the Sierra Nevada de Chita and Cocui (16,800 feet). «From whatever point of view we examine Colombia — be it scientific, historical, political, or economical, whether we are investigating the habits and customs of its people or its trade routes, markets and industries — we find the mountains an ever-present, a predominant factor. The immense tropical forests have been scarcely less an impediment.» The effects of the extreme rugosity of the second in size of the West Indian Islands should be studied in this connection. See the article on SANTO DOMINGO.

Climate.— The coast and some interior valleys are intensely hot and insalubrious. On the elevated plateaux the temperature is that of perpetual spring. The lowest average temperature in any inhabited part of the mountainous country is 20° F. The peaks of the Cordilleras are covered with snow always. In spite of the equatorial situation of Colombia, the Andes make temperature merely a question of altitude. At Bogotá the thermometer ranges from 55° to 70° F. Alternating periods of dry weather and rainy weather, each generally of three months' duration, are Colombia's «summer» and «winter.»

Flora and Fauna.— Vast tracts of forest remain to be explored. It is assumed that rare botanical treasures will be found in their recesses; and with good reason, since the known varieties of Colombian flora are of exceptional interest. Building, cabinet and dye-woods are plentiful; the rubber-tree, the cinchona, wax-palms, cedar, balsam of tolu, lignum vitæ, copaiba and mahogany flourish. The aloe, the sarsaparilla and other medicinal plants grow in abundance. Wild animals of the intertropical or higher regions are the puma, bear (two species), jaguar, sloth, armadillo, tapir, deer, cavy, opossum and 17 distinct species of monkeys. Serpents are not found at a greater height than about 5,000 feet above the sea, though they are very numerous in the lowlands. Characteristic birds are parrots (many varieties), paroquets, cockatoos, lorries, cranes, storks and condor.

Political Divisions and Population.— The republic of Colombia consists of 14 departments, 2 intendencies and 7 commissaries. These with their areas, populations and capitals were in 1912 as follows:

DEPARTMENTS	Area (in square miles)	Population	Capital	Population
Antioquia	22,752	739,434	Medellin	71,004
Atlantico	1,008	114,887	Barranquilla	48,907
Bolivar	22,320	420,730	Cartagena	36,632
Boyacá	16,460	586,499	Tunja	8,971
Caldas	7,380	341,198	Manizales	34,720
Cauca	20,403	211,756	Popayán	18,724
Cundinamarca	8,046	713,968	Bogotá	121,000
Huila	8,100	158,191	Neiva	21,852
Magdalena	19,080	149,547	Santa Marta	8,348
Nariño	9,360	292,535	Pasto	27,760
Santander Norte	6,255	204,381	Cúcuta	20,364
Santander Sur	17,865	400,084	Bucaramanga	19,755
Tolima	10,080	282,426	Ibagué	24,693
Valle	3,897	217,159	Cali	27,747
INTENDENCIES				
Chocó	68,127	68,127	Quibdó	....
Meta	....	29,309	Villavicencio	....
COMMISSARIES				
Arauca	....	4,922	Arauca	....
Caquetá	....	24,534	Florencia	....
Goagira	....	53,013	Puerto Estrella	....
Juradó	....	8,207	Pizarro	....
Putumayo	....	31,380	Mocoa	....
Urabá	....	6,476	Acandi	....
Vaupés	....	5,545	Calamar	....
Total	440,846	5,064,308		

Of the 5,000,000 inhabitants 10 per cent are pure whites, 5 per cent pure blacks, 40 to 45 per cent aborigines, 30 per cent *Cholos* (descendants of Europeans and aborigines), and 10 to 15 per cent mulattoes. The urban population, in the 12 cities of 19,000 or more inhabitants, may be placed at 500,000; or about 600,000 if we include towns of 6,000. The estimate made by Professor Sievers is, for the inhabitants of such cities and towns, 10 to 12 per cent of the entire population.

History.—In 1508 the Spanish Crown granted to Ojeda the district between Cape Vela and the Gulf of Darien, and to Nicuesa the country from the Gulf of Darien to Cape Gracias à Dios. The two territories were united in 1514. Balboa's discovery of the "Southern Sea" was followed by the removal of colonists to the Pacific Coast and the founding of the city of Panamá. Starting from Santa Marta 6 Aug. 1536, Gonzalo Jiménez de Quesada led 700 infantry and 80 horsemen into the mountains of New Granada (now Colombia), and took the Indian capital Bogotá. Colonies were established in the table-lands and along the coasts. The city of Medina was founded in 1670 by Fray Alonzo Ronquillo of the order of Preaching Friars. In 1719 the natives destroyed the Spanish colonies on the Pacific slope. New Granada became a vice-royalty in 1740, having been administered previously as a simple presidency, except in 1718–19. In 1810 an insurrection against the government of Spain began. In 1819 New Granada and Venezuela were united, Ecuador joining the union two years later. The country thus formed was called the republic of Colombia. The efforts of Spain to retain these colonies ceased in 1824. Six years later the Colombian union was dissolved, Venezuela and Ecuador having withdrawn; and the republic of New Granada was established in 1831, its territory corresponding to that of the present republic of Colombia. New Granada was at first divided into five departments, namely: Boyacá, Cauca, Cundinamarca, the Isthmus and Magdalena. Lack of coherence caused a civil war in 1840; Panamá and Veragua unsuccessfully sought independence in 1841. From 1849 to 1857 the Liberal party controlled the government. In 1853 the right was granted to the departments to elect their governors by popular vote, and the powers of the provincial legislative bodies were increased. New political divisions were organized soon afterward. These claimed, and taught the older departments to claim, the privileges of semi-independent states. A civil war, beginning in 1859, resulted in a triumph for the Liberal (States' Rights) party. Under the constitution of 1863 the name Colombia was reverted to, the official title being United States of Colombia. Nine sovereign states were formed, each authorized to maintain its own military forces without restriction, and to nullify the federal laws., Insurrections prevented steady progress until a reasonable degree of federal control was asserted. In 1880, Rafael Nuñez became President. His influence secured to the national government the right to use its forces for the suppression of insurrections in the several states. A national (government) bank was incorporated; diplomatic relations were established with Spain; the question of the boundary between Colombia and Venezuela was submitted to arbitration. Nuñez held the same office, which he made important, again in 1884 and 1886. In 1891 he was elected for the fourth time, but allowed Vice-President Caro to assume his duties.

A new constitution was adopted in 1886. By this the states were reduced to departments, with governors appointed by the President of the republic, and legislative assemblies elected by the people. The President's term of office was extended from two to six years. Colombia passed from the extreme of a loose federation to a centralized republic. Subsequent revolutions have shown the desire of the Liberals to return to the old irresponsibility. In 1892 subsidies were granted for the construction of several important railways, and new cable lines along the coast and telegraph lines in the interior were authorized. Two years later a law was passed providing for the free coinage of gold and the redemption of the paper currency. Very little progress was made, however; on the contrary the means of communication and transportation, as well as the medium of exchange, displayed a tendency to go from bad to worse. The rebellion of 1895 was suppressed in 45 days, but a civil war which broke out 17 Oct. 1899 proved to be more ruinous than any preceding conflict. The Liberals attempted, by force of arms, to drive the Conservatives from power. An issue which, in a republic, should be settled at the polls, cost the lives of 50,000 soldiers, while among the wretched non-combatants the number of deaths from privation and disease was vastly greater. As usual, the department of Panamá was a centre of disturbance. American marines were landed to guard the stations and railway at Colón and Panamá, in accordance with the treaty of 1846 between the United States and New Granada, by the terms of which the United States guaranteed the neutrality of the isthmus and assumed the obligation to protect free transit between the ports mentioned. Toward the end of 1902 the flame of civil war finally went out. The government was almost destitute of money; it could neither pay interest on the national debt nor meet current expenses. Congressional elections were held throughout the country. The most important matter to come before Congress was the question of ratifying a convention concluded at Washington 22 Jan. 1903, between the Secretary of State of the United States of America and the chargé-d'affaires of Colombia, for the construction of a ship canal to connect the Atlantic and Pacific oceans. The French Panama Company, formed in 1881, had suspended operations in 1889, and in 1894 a new company had been organized, securing a concession for 10 years, which term was subsequently extended by six years. The board of this company had offered (4 Jan. 1902) to sell all its property and rights to the United States for $40,000,000. The Panamá route had been approved by the Isthmian Canal Commission of the United States. After a long discussion in the Senate of the United States, the convention was submitted to the Colombian Congress, the constitution of 1886 providing that ratification by both Houses is requisite for the validity of such an agreement as that relating to the Panama Canal. The convention, commonly known as the Hay-Herrán treaty, was defeated at Bogotá, 24 members of the Senate voting on 12 Aug. 1903 to reject it. A counter-proposition prepared by a commission (29 August) was debated for a while, but not adopted. The adjournment of the Colombia Congress on 31 October was followed almost immediately by the outbreak of a carefully planned "Separatist" movement in Panama. Independence was proclaimed 3 November and Colombian army and navy officers in the principal city of that department were imprisoned. A provisional government was organized. American warships were ordered to the Isthmus; marines landed at Colón; and the Colombian troops withdrew from that town. On 6 November the government of the United States entered into relations with the government of the republic of Panamá, and on 13 November M. Philippe Bonau-Varilla was formally received by President Roosevelt as minister of the new country. At that time hostile demonstrations against the Colombian government occurred at Bogotá, and another revolution seemed imminent.

While political factions have continued to resort to arms for the settlement of differences of opinion within the nation's boundaries, the better sentiment of an increasing class of educated people has begun to make itself felt in the disputes with neighboring republics touching the location of those boundaries. Arbitration has repeatedly taken the place of foreign wars. An agreement was made 15 Dec. 1894 for submitting to arbitration the question as to the southern line between Colombia and Ecuador and Peru. President Loubet of France acted as arbitrator of the boundary dispute with Costa Rica, rendering a decision 11 Sept. 1900.

In recognition of difficult questions that had arisen, and in anticipation of those that might arise out of Panama's secession from Colombia and the creation of the Panama Canal Zone, Secretary Taft effected (17 Aug. 1907) an agreement between representatives of Colombia, Panama and the United States. This agreement was general in its scope, and particular applications of its main principle were observed, both at the end of the year 1908, when negotiations between Colombia and Panama reached an advanced stage, and at the beginning of 1909, when a treaty between the United States, Panama and Colombia was signed. Hostility was manifested in Colombia to that portion of the treaty which exonerated the United States and Panama from the charge of injustice to Colombia in the matter and manner of Panama's secession. Thereupon President Reyes tendered his resignation, and his successor, President Valencia, advocated the reference to The Hague of that question and also of the question as to indemnity for the alienation of Colombia's most famous and valuable department. The following year (1910) saw riotous demonstration of the anti-American feeling in Bogotá, for which an apology was offered to the Minister of the United States. On 20 July the centennial anniversary of Colombia's independence was celebrated. In 1911 territory claimed by Colombia as a portion of her southern domain was occupied by Peruvian troops. A battle was fought there, and the Colombians were defeated. In 1913 the proposed development of the petroleum industry in Colombia by a British syndicate aroused opposition in the United States. The liberality of the terms was construed as the grant of a monopoly, and the proposals were withdrawn. For an explanatory reference to Colombian oil-fields, see section *Banking and Finance.* On 4 Nov. 1913 the Congress at Bogotá adopted a resolution affirming Colombia's isthmian rights, 10 years having passed since the severe loss had been sustained. Don José Vicente Concha (clerical-conservative) became President in 1914. During that year there was "no little satisfaction at the prospect of receiving, under a pending treaty, $25,000,000 (from the United States) and of acquiring special privileges in respect to the Panama Canal. Taking advantage of the presumably more favorable spirit which the treaty had created in Colombia, an American 'scientific mission' was sent to spend eight years and $400,000 exploring the country." But in 1915, when the proposed treaty was under consideration by the Senate of the United States, its provision for the payment just named, coupled with apology for the methods employed in securing the Canal Zone privileges and obligations, made favorable action by that body entirely impossible. However, the following year (18 Feb. 1916), the Senate of the United States, by a vote of 55 to 18, ratified a plan to pay Colombia $15,000,000 in return for her acknowledgment of the American government's right to the Canal Zone. In Colombia's national budget for 1915–1916 the estimated expenditures were more than 25 per cent in excess of the estimated receipts.

Government.— Some of the amendments to the constitution adopted by legislative Act number 3 of 1910 were: The legislature shall in no case prescribe the penalty of capital punishment; new emissions of paper money of compulsory circulation are absolutely prohibited; and the Congress shall annually elect two designates, a first and a second, who shall exercise the executive power in that order in case of a vacancy in the presidency. The Senate shall be composed of as many members as correspond to the population of the republic in the ratio of one for each 120,000 inhabitants and two substitutes shall be elected for each senator. The Chamber of Representatives shall be composed of one representative for each 50,000 inhabitants. The President of the republic is elected by direct vote, for a term of four years. In case of foreign war or civil disturbance he, with the signature of all the ministers, may declare public order disturbed and the republic or any part thereof to be in a state of siege. By such a declaration the government has, in addition to the powers conferred by the laws, such powers as govern war between nations pursuant to the accepted rules of international law.

The old doctrine of the sovereignty of departments has been rejected in favor of the centralized system. The brief sketch which follows shows the leading provisions of the constitution adopted in 1886 and transformed by amendments in more recent years:

The executive overshadows the legislature and judiciary. (Contrast: CHILE — *Government*). Appointed by the President and freely removable by him are the ministers of state and government, foreign relations, hacienda or exchequer (in charge of government revenues), treasury (in charge of disbursements), war, public works and education. These ministers are also responsible to the legislature. Naturally, then, frequent shifts and changes in the ministry are the rule «and rarely,» says Mr. Eder, «is a minister in office long enough to build up his department or carry out his own policies.» The governors of departments (the main political divisions of the republic) are appointed by the President and retain office by retention of his favor. The governors, in their turn, designate and control both the prefects of the provinces (the main subdivisions of departments) and the alcaldes of the municipalities; and thus, mediately or immediately, officials throughout the country are dominated by the central executive at Bogotá. The only provision made for home rule is found in the limited powers of the departmental assemblies and municipal boards, both elected by popular vote. The revenues of the departments are inadequate to support efficient local administration. Departments and municipalities (with the exception of a few large cities that have special sources of revenue) levy what little they can by indirect taxes, often of an unwise and hampering character. This economic helplessness of the departments increases and emphasizes their dependence upon the national government, which has at least its revenue from customs duties, mines, stamped paper, etc. So all power is centralized at Bogotá.

Sessions of the Senate and House of Representatives, forming the Congress, are held annually. «Presidents have exercised the right, instead of having elections for Congress, of convoking a National Assembly, the membership of which has been appointed by the departmental assemblies, upon which pressure can be somewhat more readily exerted by the executive than upon a direct vote at honestly conducted polls. The distinction between a Congress and a National Assembly is somewhat hard for the foreigner to grasp, especially as the constitution makes no provision for the latter body; but it is held that the right of the sovereign people to assemble is inherent and superior even to the constitution itself.» It was stated in the preamble of the executive decree convoking such an assembly in 1905 that the basis for an act of such transcendent importance must be sought, not in the constitution but in the supreme law of necessity. Such an assembly can, indeed, amend the constitution without the more deliberate proceedings which that instrument prescribes. The constitution may be amended only by a legislative act first discussed and approved by the Congress in the usual manner, and in like manner considered at the next succeeding annual session and thereat approved by both chambers, after second and third hearings, by an absolute majority of the whole membership of each of the chambers.

The Judiciary and the Codes.— The Supreme Court has nine members, four elected by the Senate and five by the House of Representatives. In each case the term is five years, and nominations are made by the President of the republic. The Supreme Court magistrates appoint, as judges of the Superior Courts, the nominees of the departmental assemblies. Municipal judges, however, are elected by the local boards. The Commercial and Maritime-Commercial codes are chiefly based on Spanish law, though the influence of French law is not to be overlooked. The same influence strongly affects the Penal Code, and the Civil Code is founded on the Code Napoléon. The title «doctor» is commonly bestowed upon lawyers of prominence or university training.

Education and Religion.— Colombia has long claimed to be the most literary country in Latin America. The best of her scholars and writers have been regarded at home and in the mother country as inferior only to those of Spain among the peoples using the Castilian tongue. But in spite of this distinction, it is only lately that the nation has come to realize the importance of educating the mass. Now, however, the direction of the educational system of the whole republic is in the hands of the Minister of Public Instruction. In 1916 there were in Colombia 5,137 primary schools and 5,733 teachers with 325,756 pupils. Most of the secondary schools are as yet entrusted to the corporations of the Catholic Church, which is by law the established religion of the republic; and as such are financially assisted in the work of education by the national treasury. In 1916 there were 344 secondary and professional schools with 29,138 pupils; and in addition to these, 43 art and trade schools with 2,380 pupils; and several higher colleges and universities. Of these the oldest is the University of Bogotá, founded in 1572, which with the School of Mines at Medellín are national institutions. Several of the political departments maintain universities. Among these are the universities at Medellin, Cartagena, Popayán and Pasto. In the 28 normal schools of the republic there were, in 1914, nearly 2,000 students. There are also schools of mines at Pasto and Medellin where pupils are graduated as engineers. The amount devoted to education in Colombia is being increased from year to year. The amount expended for this purpose in 1914 was 3,445,225 pesos, the greater part of which came from the treasuries of the various departments. There are numerous libraries and museums throughout the country and a national museum, national library and national observatory at the capital, Bogotá. The University of Cartagena, department of Bolívar, comprises five «schools,» devoted to philosophy and letters, science, medicine and the natural sciences, law and political science and mathematics and civil engineering. A school of mines is maintained by the national government at Medellín, capital of the department of Antioquia. According to the report of the director of education 266 primary schools, public and private, gave instruction, in the department of Cartagena, in 1916 to about 12,250 students, with an average attendance of 8,059. Primary education is free, but not compulsory. The private schools are generally superior in instruction to the primary public educational institutions and are attended by children of the upper classes. In Colombia there are four Catholic archbishops: of Bogotá, Cartagena, Medellin and Popayán, the first of which has four suffragans, and each of the others two, among which is that of Panamá, attached to Cartagena.

Agriculture.— Agriculture is the principal industry of Colombia and is especially favored by soil and climate. The low and torrid regions (coast and valleys produce coffee,) sugar cane, bananas, cacao, yucca, cotton, tobacco, indigo, vanilla, rice and many kinds of tropical fruits. The temperate middle region of the Andes is suited to the cultivation of wheat, barley, corn, etc., but these grains are not produced in very large quantities owing to the lack of means of transportation. The rubber tree and copaiba grow wild and are tapped. The cattle raising industry is important in the great plains of the southeast and cattle hides are an important export. The total number of cattle in the republic is about 7,000,000. There are some excellent horses and mules of Andalusian stock. The government has adopted measures to make experiments in irrigation of tropical lands and to place artesian wells at various points on the plains. A recent law covers this project and provides for the establishment of schools of tropical agriculture and a central bacteriological institute. Coffee is Colombia's most important article of export, is grown principally in the Medellin district and the Cauca Valley. Colombian coffee commands a high price and finds a ready market in Europe and the United States. The new Cali Railway will stimulate the industry in the Cauca Valley. Much of the rubber shipped abroad is of the uncultivated variety, but in the Atrato Valley and elsewhere the tree is under cultivation. The production in 1915 increased 100 per cent over that of the preceding year, and the industry is still in its infancy. The Sinú and Atrato valleys abound in fibrous plants, such as fique and pita, and on the banks of the Magdalena River plants of the agave family and a species of henequen, called locally "plantanillo," grow in great numbers. These various plants produce an excellent grade of fibre which is used throughout the country for making rope, rugs, hammocks, etc. The manner of separating and cleaning the fibre is crude and primitive, the plants being flagellated until the fibres separate, when they are put in the sun to dry. The introduction of machinery for separating the fibre economically should create a thriving industry. Ipecac is an important agricultural export. In 1915 there was a large increase in the tonnage and value of shipments of this commodity. The plant grows wild in the Sinú Valley and a small toll is assessed by the government on all ipecac gathered on public lands.

There are productive tobacco lands near the coast and in the department of Santander, but the district of Ambalema produces the best grade and the greatest quantity of tobacco. The larger part of it is used locally for manufacturing cigars and cigarettes, although the exports have been important during some years. There was less tobacco grown than usual in 1915 owing to the expected curtailment of the market abroad. The invoiced price of exported tobacco early in 1915 was six cents a pound, which increased to eight cents in November.

The elimination of Germany from the market in 1915 left the exporters of tagua or ivory nuts in this district with quantities on hand that could not be disposed of elsewhere. It is owing to the neglect in sorting the nuts according to size and grade that has prevented Colombian exporters from selling greater quantities in the United States. The prevailing local price of tagua during the year was $40 a ton. Land for agricultural and other purposes is cheap and generally well watered, but the scarcity of labor is one of the greatest difficulties in developing the country. There are many varieties of hardwood, but only cedar and mahogany are exported to any extent.

Commerce.— The value of Colombia's imports in the last normal year before the European War, 1913, was given as $28,535,800, exports in the same year reaching the sum of $34,315,800. After Brazil, Colombia exports more coffee than any other country. It is estimated that the annual exports amount to 1,000,000 bags of 60 kilos each (132 pounds), produced by 125,000,000 coffee plants. As these plants are valued at 30 cents apiece, they represent an investment of $37,500,000. The exports of coffee in 1915 were valued at more than half of the total exports, being $16,247,672 out of a total of $31,579,131. The United States consumes the bulk of Colombian coffee, importing 91,830,513 pounds out of Colombia's total exportation of 136,215,413 pounds in 1914, and taking 111,077,449 pounds out of the exports of 149,111,674 pounds in 1915. Other items in the export list are: Bananas, tagua, hides, leaf tobacco, rubber, gold, "Panama" hats and platinum. Imports from the United States in 1913 were valued at $7,629,500, and exports to the United States $18,861,800. In the same year, the imports from Great Britain were valued at $5,837,490, and exports to Great Britain, $5,566,000; imports from Germany, $4,012,100 and exports to Germany, $2,216,200; imports from France, $4,408,600 and exports to France, $797,000. Colombia imported from the United States, Great Britain, Germany, France, Belgium, Italy and other countries in normal years, before the outbreak of hostilities in Europe, articles of the following classes: Textiles, foodstuffs, metals, cars and carriages, materials for arts, drugs and chemicals, fuel and lighting, agricultural and mining implements, electrical supplies, paper and cardboard, wines and liquors, arms and munitions, etc. In domestic commerce many articles appear which are manufactured in the country on a very small scale, partially supplying home consumption. Exports from the United States to Colombia were valued at $8,980,177 in 1915. Exports to the United States from Colombia in 1916 increased over $9,000,000, according to the declared returns received from the consulate of the United States at Barranquilla. The total exports for 1915 were $18,656,662 and for 1916 they were $27,759,081. Large increases are shown in the shipments of bananas, coffee, gold bullion and hides. The increase in exports of platinum is especially large. In 1916, coffee to the value of $16,616,686 was exported as compared with $12,632,829; hides and skins valued at $3,632,359, as compared with $2,122,595; gold bullion, $2,009,079 against $903,441 in 1915; bananas, $1,667,213 against $863,483; platinum, $1,456,648 against $504,302 in 1915. Rubber, sugar, tanning extract and ivory nuts figured in the exports to the extent of about $250,000 each.

Manufactures and Mining.— According to government statistics Colombia in 1916 had 121 manufacturing plants, in which was invested a total capital of $12,406,000. The list prepared by the government is not complete, as several well-known factories are not represented. There are two plants (sugar and oil) of over $1,000,000 capital. Three textile factories and one electric plant have capitalizations of over $500,000 each, and 10 enterprises (4 textile mills, 2 match factories, 1 flour mill, 1 cement plant, 1 chocolate factory and 1 tanning extract plant) are capitalized between $200,000 and $500,000 each. Twelve factories have capitalization between $100,000 and $200,000; 15 between $50,000 and $100,000; 50 between $10,000 and $50,000; and 28 less than $10,000. The principal manufacturing centres are Bogotá, Medellín, Barranquilla and Cartagena. Bogotá has 40 plants with a combined capital of $3,013,000; Medellín has 30 with a capital of $2,380,600; Barranquilla, 18 with $1,370,000 capital; and Cartagena, 12 with a total capital of $2,993,000. In the Cartagena factories are included a sugar mill at Sincerin, some 20 miles distant, which is capitalized at $2,000,000. With the exception of sugar, the exports of which in 1915 amounted to $98,265, practically none of the products of these manufacturing industries is exported. In fact their output, except in a few articles, is not sufficient to meet the domestic demand. For instance, with 7 large and 14 small textile mills in the country, the imports of drills, sheetings and print goods amounted to $3,343,383 in 1915.

The manufacture of Panama hats is an almost entirely decentralized industry, which occupies many individuals and families in the small communities of the interior. The 1915 production of hats was valued at about $1,000,000, exports having amounted to $966,846. The industry suffered greatly in the early part of 1915 through the curtailment of the purchasing power of the buyers and the decreased demand from the principal market, the United States. Declared exports of Panama hats at American consulates amounted to $566,683 as against $1,080,508 for 1914, a decrease of $513,825, or almost 50 per cent. The wages paid male laborers in Colombian factories are $0.50 to $1 per day, the average being about $0.60. Women receive $0.25 to $0.35 daily. In the coast towns most factories work only eight hours, but in the interior 10 hours is the rule. Shipbuilding is an important industry in Cartagena in normal years, but in 1915 there was a noticeable decrease in the number of vessels constructed. The ships built here are for the coastwise trade and consist of small skiffs and schooners, sometimes equipped with motor power engines which are generally imported from the United States.

Mineral Resources.— Gold which has been and continues to be the most important mineral product of Colombia is found both in lodes in the mountains and as grains and dust in the alluvial deposits of the river valleys. The principal gold area is between the Magdalena and the Pacific Coast, and south of the point where the Cauca joins the Magdalena. The province of Antioquia is the most important area of production, which centres around Medellín. In 1912 the exports of gold were $6,634,914. The rapid growth of platinum production since 1907, when only 245 troy ounces of the metal were exported, can be realized from the fact that in 1915 the shipments amounted to 11,046 troy ounces and were valued at $494,888. This entire amount came from the Choco and was panned out of the gravels of the small streams. The area of the platinum producing zone is small, beginning near the mouth of the Condoto River and extending a short way north of the rivers Nemotá, Bebaramá and Neguá, a longitudinal distance of about 90 miles. The strip is not much more than 30 miles wide. An American company was formed during the latter part of 1915 to exploit platinum-bearing lands and to dredge a section of the San Juan River. Silver is mined to a certain extent, the normal output fluctuating but running between $400,000 and $700,000 annually. Copper is pretty generally distributed, being found especially all along the mountains adjoining the Magdalena Valley, from the Ecuadorian boundary to the mountains of Santa Marta on the coast. Iron ore in large quantities occurs in various parts of the country but is especially important in Cundinamarca. Extensive coal deposits have been discovered and seem to be scattered over many parts of the country. The principal beds now worked are near Amaga in Antioquia. Coal mines do not come under the provisions of the Mining Code in regard to filing of claims. The government controls the coal in its unoccupied lands, and it may be worked only by contract with the government, but owners of lands containing coal may work their mines independently. Oil has been found in various parts of the country, especially around Cartagena and Barranquilla. Sulphur, salt, emeralds, lime, nitre, chalk, marble, asphaltum, alum, magnesia, amethysts, lead, tin, manganese, mercury and cinnabar are found in various parts of the country.

Banking and Finance.— The principal banks of the capital city are the Banco de Bogotá, Banco de Colombia, Banco del Comercio, Banco Central and C. Schloss y Cia.; those of Cartagena are the Banco de Bolivar, Banco de Cartagena, Banco Industrial and Pombo Hermanos; those of Barranquilla are the Banco Comercial de Barranquilla and Alzamora, Palacio y Cia.; those of Medellín are the Banco Aleman-Antioqueño and Restrepos y Cia. The circulating medium was only paper, having approximately the value of one cent American gold per peso in 1914. It is both gold and paper. The theoretical unit was the peso of 1.5976 grammes of gold .91666 fine, divided into 100 centavos; and a law was passed designed to fix its value at one-fifth of a pound sterling, which would be the actual value of such a coin. For official payments and judicial liquidations the legally established value of the paper currency at the time was given in relation to the pound sterling and in the proportion of £1 as the equivalent of 500 paper pesos. Mr. Joseph T. Cosby wrote in 1915 as follows: "Since then the actual par of exchange is 10,000 per cent, when quotations vary from this par they are considered as at either a discount or a premium, as the case may be. For instance, if the commercial quotation for demand draft on London is expressed as 10,500 per cent, this would represent a premium over par of 5 per cent, since £1 would cost 525 pesos instead of 500 pesos, the par at 10,000 per cent." American and English gold coin circulates freely in Colombia. The shipments of Colombia's export products are usually financed through the medium of credits, and these credits were, to a large extent, canceled soon after the war in Europe began, exchange rates advancing to 11½ per cent above normal. At that rate, $100, currency of the United States, cost 11,150 Colombian paper pesos. The method of quoting exchange rates in Colombia is as follows: Madrid, 500 pesetas, 9,550 per cent = 9,550 pesos paper; New York, 100 dollars, 10,250 per cent = 10,250 pesos paper; Paris, 500 francs, 9,950 per cent = 9,950 pesos paper; Berlin, 400 marks, 9,850 per cent = 9,850 pesos paper; London, £20, 10,000 per cent = 10,000 pesos paper. A coinage law was promulgated by the President in the *Diario Oficial* of 19 Dec. 1916. Under this law the government will coin gold, silver and nickel pieces, and will recoin old and foreign pieces, standardizing in value the money in use throughout the country. The government is authorized (1917) to coin gold pieces of established weight and fineness in the mints of Bogotá and Medellín, when gold is needed in circulation, and when individuals present gold for coinage, the work is to be done at cost price; to complete the mint at Bogotá, and to arrange with the departmental government of Antioquia for the purchase or lease of the mint at Medellín to be enlarged and put into shape to coin an adequate amount of money. An appropriation of $50,000 annually for coinage purposes is to be included in the next budget and in succeeding budgets until the amount of $200,000 is reached. The funds of the conversion board may be used in exchange for national silver pieces coined before 1911 and foreign silver coins now in circulation in Colombia. The Colombian government recently authorized the exchange of gold notes for the old paper money in circulation. The *Diario Oficial* announced that the exchange would be made in Bogotá by the conversion board, through the exchange office, during the period from 1 March to 19 Dec. 1917. Three comprehensive pamphlets dealing with the financial and economic situation of Colombia, with her public works, etc., were submitted by the Colombian delegates to the First Pan American Financial Conference and are embodied in the report of proceedings (Washington 1915). Attention was invited especially "to the geographical location of the Republic of Colombia, its relation to the Panama Canal and the proximity of the principal Colombian ports to both entrances of the canal. This being visualized, it is at once self-evident that the hostage to the future given by the United States by the construction of the canal makes it imperative in the interests both of the United States and of Colombia that the two countries should establish relations of the greatest intimacy." The Colombian committee also expressed a belief that it is "in the interest of all the American republics, whose future commerce will pass through the Panama Canal, and especially essential to the United States, that adequate harbor accommodations and facilities for transshipment and storage should be installed at the Colombian ports of Santa Marta, Cartagena and Buenaventura. To assure the proper development of these ports it is also felt that the sanitation systems should be perfected." In addition, the attention of the conference was called "to the possibilities of railway constructions which would stimulate the development of the rich natural resources of the country, and thus build up a traffic which would find its way to the markets of the world through the ports mentioned." The suggestion was offered that, if American capital should go to this country, which is larger than Germany and France together, or larger than all the coast States from Maine to Florida, including Ohio and West Virginia, it "could take advantage of the greatest and best classes of business and also obtain the contracts for the construction of the most indispensable public improvements of the country," as the English did in Argentina from 1860 to 1880. Interesting statements made by the Colombian committee are the following: In the order of their importance, the workable mines are, first, those of gold, silver, iron, copper, platinum and emeralds; second, petroleum (found in large fields both near the coast and in the interior); third, coal, which "is to be had in every part of the republic." Platinum and emeralds are not found elsewhere in paying quantities except in Russia. In eastern Colombia there are immense plains well adapted to the cattle-raising industry, and communication with that region might be secured by means of a railway along the Patia River, which has carved its way through the mountains, as we have said above, and empties into the Pacific Ocean, a two days' journey from the Panama Canal. No convincing evidence is at hand as to the feasibility of this plan. Customs duties yield about 75 per cent of the total yearly revenues of the government, and the export tax on the two or three Colombian products liable to duty is so small that it need not be taken into account.

The foreign debt for loans, subventions and guarantees of interest on railways is payable in London and amounts to £3,923,720 or $19,051,479, only $3.75 per capita. Law 69 of 1909 gave the control of the currency to a board of three persons, called the Junta de Conversión, the paramount duty of the board being to collect a conversion fund in gold coin with which to guarantee the paper money in circulation; and it appears that about 50 per cent of the gold value of the paper money (in the proportion £1=500 paper pesos, for official payments, etc., as above) had been collected (1917). The banks doing business in Bogotá have a total capital of $4,350,000. The law does not allow banking institutions to issue notes. In 1913 the exports were larger by $5,780,000 than the imports, so that the liabilities assumed in the first six months of 1914 were not based on credit alone; and for that reason it was not found necessary, when the European War broke out, to grant a moratorium either in favor of the banks or of private business men.

Transportation and Communication.— About 700 miles of railway were in operation (1917). These railways belonged to different companies. As the commerce of the interior is carried on the river systems, with railways as their auxiliaries, the lines of the latter are short. Important in this respect are the following rivers: Magdalena (navigable for over 900 miles), Cauca, Nachi, Cesar, Lebrij and Sogamoso. Steamers ascend the Magdalena to La Dorada, 592 miles from Barranquilla, while smaller boats carry on traffic far into the interior up the tributaries. About 50 steamers (1918) plied regularly on these waters. The only way of reaching the national capital from the Caribbean coast is up the Magdalena and thence over the mountains, partially by highway and partly by railway. The chief ports are (on the Caribbean side) Barranquilla, Cartagena, Santa Marta and Riohacha, and, on the Pacific, Buenaventura. The government had under consideration (1917) a survey of the Bay of Málaga or Magdalena on the Pacific Coast, with a view of establishing a new port there with modern facilities. Points of export and entry on the Venezuelan frontier are Cucuta and Arauca. The ports are in communication with European and American countries. There were, before the European War, seven lines of mail steamers (three British and the others French, Spanish, Italian and German), and trade service between the United States and Colombia was furnished by The United Fruit Company, weekly sailings, American; Hamburg American Line, weekly sailings, German; Panama Railroad Company's steamers, weekly sailings, American; Royal Mail Steam Packet Company, fortnightly sailings, British. The number of post-offices is given as 843 (in 1915), and there are 12,000 miles of government telegraph lines.

Army and Navy.— Military service is compulsory under the law for from one to one and one-half years, but military training is bestowed upon a handful of young men only. The peace footing of the army is 6,000 to 7,000, consisting of three divisions of two brigades of two regiments of infantry, a total of 12 infantry regiments, one cavalry regiment of four squadrons, one artillery section, one engineer battalion and one transport battalion of three companies. The infantry arms are Remington, French Gras and Mauser rifles; and the police strength in 1914 is given at 2,328 men. Vessels of the navy consist of a few cruisers and gunboats, tugs and troopships. There are no modern or really valuable ships.

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JOHN HUBERT CORNYN,
Editorial Staff of The Americana.

COLOMBO, Mateo Realdo, Italian anatomist: b. Cremona; d. Rome 1559 (date disputed by some authorities). He devoted himself to the practice of pharmacy, then studied surgery and anatomy at Padua under Vesalius, whose assistant and friend he became, and Leonicus. He then spent some time in Venice, and was called in 1542 to fill the chair left temporarily vacant by Vesalius, who had gone to Germany. When Vesalius left Padua definitely in 1543 to go to Spain, Colombo was his successor, and met with great success. In 1546 he went to Pisa to teach, and in 1549, at the call of Paul IV, to Rome. While Colombo perpetuated some of the errors of Vesalius, and introduced some anew, he was an able anatomist. He made more human dissections than any of his predecessors and introduced the practice of vivisection on the dog and the swine. He discovered numerous facts in anatomy, among which was the pulmonary circulation, which he found out by his vivisections independently of Servetus. His researches are to be found in his ‘De re Anatomica Libri XV’ (Venice 1559).

COLOMBO, Ceylon, the capital, seaport on the southwest coast, near the mouth of the Kelani River, and about 70 miles southwest of Kandy, the principal place on the island. It is a handsome town, and a portion of it, comprising most of the best houses, is within the walls of its very extensive fort, which occupies a projecting point of land and embraces a circumference of nearly one and a fourth miles. The houses of the Europeans outside the town are very beautifully situated, especially those near the sea. There are several bazaars or market-places. The public buildings comprise the government offices, government house, hall of the Supreme Court, the valuable museum, etc. Some of the noted buildings are an old Dutch church, Presbyterian, Anglican and Roman Catholic churches, hotels, orphan asylum, military hospital and barracks, the town-hall, the railway station, the Colombo Royal College, Saint Thomas' College and Wesley College. The Moors have two handsome mosques with minarets; the Hindus also have their temples, rudely sculptured. Water is brought from a distance of 30 miles to the town and there are extensive gas-works. The harbor was formerly capable of receiving small vessels only, and large ships had to cast anchor upward of a mile from the shore, exposed to the southwest monsoon; but breakwaters now give complete shelter and Colombo is the regular calling station for the large steamers bound for Bombay, Madras, Calcutta, the Straits, China, Australia, etc. It is the chief port of Ceylon, its exports and imports including the great bulk of the goods sent from and brought to the island. Colombo is one of the most important coaling stations for British and foreign steamers on the Australian and East Asiatic routes. It is connected by rail with Kandy, Galle and the north of the island. It is the seat of a United States consulate. The natives are mostly artisans and laborers, while the Europeans are either owners of large plantations or merchants. It was occupied by the Portuguese in 1517 and named in honor of Christopher Columbus. It was taken by the Dutch in 1656 and by the British in 1796. Pop. 213,396.

COLÓN, sometimes called **ASPINWALL**, Panama, city of 20,000 inhabitants on the northern side of the Isthmus of Panama, connected with the city of Panama by a railway 49 miles in length. During the civil war in 1885 it was partly burned, but has been rebuilt. It stands geographically within the Canal Zone, upon an island which divides an inlet of the sea into the ports called Manzanillo and Limón Bay. American marines and sailors were landed there during the revolutions which began in 1885, 1899 and 1903, in accordance with the treaty by which the United States guarantees to preserve from interruption free transit across the isthmus. It is the northern terminus of the Panama Railway and the Panama Canal. Practically all of the land in the city is owned by the Panama Railroad, under its original franchise from the United States of Colombia, and as the United States now owns the Panama Railroad it has thus become the owner of the land, but cannot sell it. Adjacent to Colón, on Limón Bay and practically forming a part of the city, is the American city of Cristobal, where are located the great cold-storage plant of the Isthmian Canal Commission and the shops of the Panama Railroad. The deep but exposed harbor of Colón, in Limón Bay, is inferior to that of Porto Bello, 20 miles to the east, but has been improved by a long breakwater from Toro Point, erected by the Canal Commission. Steamships can come alongside the piers and the docking equipments are modern, including cranes and other apparatus. Colón was formerly either the terminus or a port of call for about a dozen lines of steamships. The city has served as an entrepôt for much of the commerce between Atlantic and Pacific ports, but has lost much of its steamship business to the new and better equipped port of Cristobal. In 1915 the number of steamships entering the port of Colón was 103 (275,410 tons) as compared with 687 (2,120,704 tons) in 1914. In addition 131 sailing vessels, of 4,536 tons, entered this port. The imports into Colón for the year 1915 were valued at $3,892,534. Of this amount, a value of $2,833,439 was taken from the United States and a value of $740,155 from Great Britain and her colonies. Figures for the exports are not available except those for exports going to the United States, furnished by the American consulate. The value of these exports for 1915 was $509,583. Of this total the larger items were: Coconuts, $234,205; rubber, balata, $128,794; tagua (ivory) nuts, $56,420; turtle shells, $29,778; cocoa, $17,850; and hides, $15,202. The prevalence of war in Europe has served to revolutionize the foreign trade of Colón, and the above figures must be regarded as indicating only a passing condition. Colón consists largely of unattractive frame houses and small shops, but many of the newer houses, including the modern municipal building and the principal public school, are of concrete. Following the great fire of April 1915, which destroyed 20 blocks in the business section of Colón, this part of the city is being rebuilt with substantial concrete structures in modern style. Under the treaty of 1903 the cities of Colón and Panama, while remaining Panaman territory, came under the jurisdiction of the United States in all matters relating to sanitation and quarantine. Formerly Colón was a notoriously unhealthful place, but the unsanitary conditions were remedied by the Canal Commission in 1906–07; sewers and a system of waterworks were constructed and stringent sanitary regulations established. Unlike Panama, Colón is not an old city, having been founded in 1850 by the builders of the Panama Railroad, which was completed in 1855. For a time it was called Aspinwall, in honor of William H. Aspinwall, one of the builders of the railroad, but subsequently the name was changed by statute to Colón, in honor of Christopher Columbus, who sailed into Limón Bay in 1502. A fine statue of Columbus, the gift of Empress Eugenie in 1870, stands near the mouth of the old (French) canal in the present city of Cristobal. When the Canal Commission undertook its work, the population of Colón was probably not much over 3,000, consisting largely of Jamaica negroes and of natives of mixed Spanish, Indian and negro blood. The census of 1911 returned a population of 17,748; estimated by the Isthmian Business Directory at 20,000 in 1915.

COLON, Venezuela, a federal territory embracing the Venezuelan islands in the Caribbean Sea, except those belonging to the state of Rivas. The islands forming the territory are Blanquilla, Los Hermanos, Frailes, Sola, Testigos, Venados, Esmeraldas, Caracas, Picudas, Chimanas, Borracha, Arapos, Monos, Píritu, Farallón, Ocumare, Orchila, Los Roques, Aves, Los Monjes and several smaller ones. The natural products are phosphate of lime, guano, lime, woods and fish. Large quantities of the plant called orchila are exported for industrial purposes. There are salt deposits in Los Roques. Gran Roque is the capital. Nearly all of the islands are uninhabited. The territory is directly dependent upon the national government, and, like the territory of Amazonas, is governed by special laws.

COLON, that part of the large intestine which extends from the cæcum to the rectum, the greater part of the large intestine. It consists of three divisions, the ascending colon on the right side of the abdomen, the transverse colon, which passes horizontally from right to left just beneath and behind the liver and stomach which cause it to bend slightly in its course, and the descending colon which passes down on the left side of the abdomen to the left iliac fossa where it joins the sigmoid flexure which extends into the rectum. The structure of the colon in comparative forms is dependent upon its function, which varies according to the nature of food. In herbivorous animals, where nutritive material in the food stuffs is enclosed in cellulose walls, the large intestine plays a considerable part in digestion. The dissolving of these cellulose walls is dependent upon the action of bacteria which are present in the large intestine for this purpose. Carnivorous animals possess a short and narrow colon, since their food undergoes practically complete digestion and absorption before it reaches this portion of the intestine. Man occupies an intermediate position in regard to structure and function of the colon. There is properly speaking no intestinal secretion in the large intestine, but the presence of alkaline substances which may favor the growth of bacteria while at the same time they neutralize the acid products of bacterial activity. The question of the normal presence and action of bacteria is a debated one. The excessive action of bacteria leads to disease conditions and yet they seem to be necessary, at least in some instances, to complete the digestive process. Antiperistaltic waves of contraction keep the food in the large intestine under a constant mixing and kneading process. Absorption from the colon is slow and consists of a variable amount of nutrient material which was not absorbed by the small intestine and of a considerable quantity of water. The excretory function is of more importance. The waste matter from the small intestine receives here the addition of many decomposition products while a large amount of water is absorbed by the colon, leaving the excretory products in the form of feces. A secretion of mucus aids in the passage of the waste material and perhaps interferes with the excessive propagation of bacteria. Consult Howell, 'A Text-Book of Physiology'; Starling, 'Human Physiology.'

COLON BACILLUS, a very common bacterium (*Bacillus coli communis*), of the intestinal canal of many animals, including man, in which place it seems to serve some useful function in the breaking down of food-stuffs, although, for lower animals at least, it is not indispensable for proper digestive processes. It is a short motile bacillus and closely resembles the typhoid organism, from which it is separated only by careful bacterial technic. While a normal inhabitant of the intestines of man, it may in abnormal situations be a cause of disease-processes. Its presence or absence in potable waters is of service in determining the presence of contamination of a water supply by animal fecal matter. See TYPHOID BACILLUS.

COLONEL, kėr'nĕl (Fr. *colonel;* Sp. *coronel;* fr. Lat. *columna*), a military officer intermediate in rank between a lieutenant-colonel and a general officer. When a regiment is a tactical and administrative unit it is commanded by a colonel, but in the present British infantry of the line the regiment is a mere aggregate of separate battalions, and colonels are either staff officers or commanders of brigades. In the British cavalry, artillery and engineers, and in the armies of most other countries the colonel has active command over bodies of troops. The regiments of the British and Continental armies have besides their active commanding officers, if the regiment is a fighting unit, or in place of these otherwise honorary colonels, who are general officers or princes of the blood and receive the emoluments of the position in addition to those of their regular rank. In Germany officers ranking between generals of infantry, cavalry or artillery, and general field-marshals are called colonel-generals.

COLONIA INDEPENDENCIA, ēn"dā-pān-dān'sē-ạ, Venezuela, in the Altagracie district of the old state of Miranda, about 70 miles from Caracas. Its area is 555 square kilometers; its altitude 5,400 feet above sea-level. Taguacita is its principal town, and its agricultural products are coffee, sugarcane, yucca and cacao. There are extensive forests and two rivers. The colony was founded in 1874.

COLONIAL, or COMPOUND, ANIMALS, organisms which cannot be fairly regarded as unities, but consist of numerous more or less similar individuals united in a common life. Among the usually single-celled simplest animals or *Protozoa,* loose colonies not infrequently occur, and are of not a little importance as suggestions of the bridge between the single-celled and many-celled animals. Such colonies arise when the original cell, instead of reproducing discontinuously, retains its daughter-cells in union with itself or with one another, much like the segments of the egg-cell of a higher animal. By sacrifice of individuality at the time of reproduction, a higher unity is formed. In the same way a simple cup-shaped sponge, by continuous budding, forms a colony of similar forms, which may possess more or less distinct individuality. The common fresh-water *Hydra,* to mount a step higher, buds off daughter *Hydræ,* which remain for a while connected with the parent organism and make it temporarily colonial.

Many marine hydroids retain their polyps permanently as constituents of such a complex organism, and, as a differentiation of these into nutritive and reproductive, and often into still other kinds, takes place, a higher order of more complex individuality arises; the polyp life is in part subordinated to the colony life. Among the most perfectly organized of such colonies are the floating *Siphonophora* (such as the Portuguese man-of-war), in which five or six perfectly differentiated and specialized kinds of zoöids act together in mutual interdependence to support the whole. In most cases such zoöids are incapable of performing any but the one function, or set of functions, to which they are adapted, and consequently cannot sustain independent life. This is one way of approaching the questions of individuality and of organization of the higher *Metazoa.* Among the higher animals that occur in colonial form are *Polyzoa, Ascidia* and *Chætopoda.* See COMPARATIVE ANATOMY.

For social communities or colonies composed of numerous free individuals, all working together for mutual benefit, and how new colonies are founded, see ANT; BEE; WASP; TERMITES, etc.

COLONIAL BOUNDARIES. See BOUNDARIES OF THE UNITED STATES.

COLONIAL DAMES OF AMERICA, The National Society of. An ancestral and patriotic organization of American women, founded 19 May 1892, and composed of one Colonial Society from each of the 13 original States, one society from the District of Columbia and one associate society from each of the non-colonial States. The objects of the National Society are: To preserve colonial history, traditions, manuscripts, records, relics and buildings; to perpetuate the brave deeds and glorious memory of the colonists, and to engender and encourage patriotism. To be eligible to membership a woman must be descended from some worthy ancestor who rendered valuable service to the colonies and who became a resident of America previous to 1750. Memberships are obtained only upon invitation from those already enrolled, and must be procured through admittance into the Colonial Society, of the ancestral State, where the service of the ancestor was rendered. The work of the Society has been patriotic. During the Cuban war nurses and supplies for the sick were supplied; at the close of the war a splendid monument, in Arlington Cemetery, Washington, D. C., «to the memory of the soldiers and sailors, who gave up their lives in the late war with Spain,» was erected by the Society «in the name of the Women of the Nation.» One of the most valuable and interesting collections of colonial relics and furnishings is under the control of the New York Society at the old Van Cortlandt manor house in Van Cortlandt Park. Churches and colonial houses of historical importance have been restored; historical sites marked with tablets; prizes awarded for essays on patriotic and historical subjects to pupils of public schools and colleges. A complete list of the soldiers and sailors who fell in the Cuban campaign form the contents of a Record Book compiled by the Society. Great credit is due this organization for preserving many historical places which otherwise might have been destroyed. The Society numbers (1918) 9,000 members. It holds a biennial council in Washington, D. C.

COLONIAL ELECTIONS. See ELECTIONS; ELECTORAL QUALIFICATIONS; WOMAN SUFFRAGE.

COLONIAL FURNITURE. See FURNITURE, COLONIAL.

COLONIAL GOVERNMENT, Proprietary. The 16th and 17th centuries constituted a period of financial and economic weakness in the English government and the proprietary colony was one of its results. When the English began their colonization enterprises the monarchy had to a great extent thrown off the evil influences of the feudalistic system, but its organization had not been brought to a state that would permit it entirely to dispense with feudalistic precedents. Hence the monarchy granted to individuals or groups of individuals extraordinary privileges in the hope and expectation that extraordinary returns would accrue to the government. Under the grant of 1584 by Queen Elizabeth to Sir Walter Raleigh, after a royalty of one-fifth of the gold and silver found had been paid to the Crown, the rights of the Crown amounted to little or nothing unless Raleigh or his assigns should «robbe or spoile by sea or by lande or do any acte of unjust or unlawful hostilitie to any of our subjects.» Power was given to Raleigh «to correct, punish, pardon, governe, and rule . . . as well in causes capital or criminall, as civil, both marine and other, . . . according to such statutes, lawes and ordinances as shall bee by him . . . devised or established.»

The early grants were made to individuals but when these showed themselves incapable of producing results without outside assistance, those aiding the enterprises were included in the grants. The chartered company was an established fact in the commercial world and accordingly, when serious attempts at colonization were made, it was natural that an experiment was tried by giving collective proprietorship to the members of such a company. Since the collective proprietors would not possess the influence of a court favorite, the London and Plymouth charter of 1606 vested the supreme government in a council resident in England and named by the king, with ordinances and laws given under his signed manual; while the subordinate jurisdiction for the conduct of affairs in the colonies was committed to a council resident in America which was to act in accordance with the king's instructions. This system did not prove feasible and under the new Virginia charters of 1609 and 1612 full control of the colony was in effect given to the company, the stockholders choosing the supreme council from among their own members and the power to legislate and govern the colony being made entirely independent of the king. The quarterly courts managed affairs in England while the governor looked after company interests in the colony. For a time harmony prevailed in the colony but abuses of power and position by the governor, the growth of settlements and the lack of any voice in the government led the colonists to demand a representative assembly, which convened at Jamestown 30 June 1619. Moreover the patentees in England began to quarrel among themselves, whereupon in 1624 the Crown canceled the charter of the Virginia Company and appropriated to itself the fruits of the labor of private individuals, thus establishing the first royal province in the country.

In 1632, therefore, when granting to Lord Baltimore the province of Maryland, the Crown returned to the practice of making individual grants and endeavored to reproduce in America the County Palatinates of Europe. Upon Baltimore and his heirs was conferred absolute proprietorship of the soil. The governmental powers bestowed are involved in some obscurity. On the one hand, the proprietor was given all the powers possessed, then or previously, by the bishop of Durham. Of itself, this was a very comprehensive grant, for the authority exercised in this northern palatinate by the dignitary mentioned was little short of absolute. The effect of the grant was materially lessened, however, by subsequent clauses in the charter which imposed large limitations. Thus the laws and ordinances of the colony must not be repugnant to the laws of England; the laws must receive the consent of the freemen of the province; and no interpretation of the charter involving any impairment of the allegiance due the king should be permitted. Still it may be said that the independent powers of the proprietor were very extensive. They included the making of war and peace, the appointment of all officers, the enforcement of martial law, the pardoning of offenders and the conferring of titles of nobility. An interesting provision was that no tax should be levied by the Crown on any person or on any goods in the colony. The proprietor possessed full power to determine the colony's government. Baltimore planned the government to consist of a governor, a council, appointed by the proprietor, and a primary assembly in which any freeman of the province might be present to speak and vote. With the growth of population the holding of a primary assembly became impracticable and in 1639 the assembly was made up mainly on the representative principle, with the hundred as the electoral area. In 1647 the assembly was divided into two chambers, the lower consisting of the elective burgesses, the upper of the councillors together with persons specially summoned by the proprietor. The suffrage, at first restricted, was broadened until the colony came to be rather more democratic than Virginia. Likewise the system of land tenure, originally aristocratic and based on the principle of large semi-feudal estates, was modified until Maryland, as compared with all the other southern colonies, became a region of numerous small freeholders.

In 1639 the province of Maine was granted to Sir Ferdinando Gorges, but this grant proved abortive. In March 1663 eight men received from Charles II a grant to Carolina in the hope that the imperial expansion policy might further the material interests of those concerned. The proprietaries could enact and publish any laws deemed necessary, with the assent, advice and approbation of the freemen of the colony; they were empowered to erect courts of judicature and appoint civil judges, magistrates and officers; to make war and in cases of necessity to exercise martial law; to enjoy customs and subsidies, imposed, with the consent of the freemen, on goods loaded and unloaded. In 1665 a new charter was granted and in order that the colony might have a settled form of government Shaftesbury drafted a code of laws in which he was aided by the famous John Locke (q.v.), who in 1669 promulgated his «Grand Model» or «Fundamental Constitutions,» the chief provisions of which were as follows:

> "The eldest of the eight proprietors was always to be palatine, and at his decease was to be succeeded by the eldest of the seven survivors. This palatine was to sit as president of the palatine's court, of which he and three more of the proprietors made a quorum, and had the management and execution of all the powers in their charter. This palatine's court was to stand in room of the king and give their assent or dissent to all laws made by the legislature of the colony. The palatine was to have power to nominate and appoint the governor, who, after obtaining the royal approbation, became his representative in Carolina. Each of the seven proprietors was to have the privilege of appointing a deputy, to sit as his representative in parliament, and to act agreeably to his instructions. Besides a governor, two other branches, somewhat similar to the old Saxon constitution, were to be established — an upper and lower House of Assembly; which three branches were to be called a parliament, and to constitute the legislature of the country. The parliament was to be chosen every two years. No act of the legislature was to have any force unless ratified in open parliament during the same session, and even then to continue no longer in force than the next biennial parliament, unless in the meantime it be ratified by the hands and seal of the palatine and three proprietors. The upper House was to consist of the seven deputies, seven of the oldest landgraves and caciques and seven chosen by the Assembly. As in the other provinces, the lower House was to be composed of the representatives from the different counties and towns. Several officers were also to be appointed, such as an admiral, a secretary, a chief justice, a surveyor, a treasurer, a marshal, and register; and besides these each county was to have a sheriff and four justices of the peace. Three classes of nobility were to be established, called barons, caciques, and landgraves; the first to possess 12, the second 24, and the third 48,000 acres of land, and their possessions were to be unalienable. Military officers were also to be nominated, and all inhabitants from 16 to 60 years of age, as in times of feudal government, when summoned by the governor and grand council, were to appear under arms, and, in time of war, to take the field."

This code was only partially put into operation; from the first the settlers regarded it with horror as a revival of feudalistic institutions and a hindrance to the progress of pure democracy and made war upon it with the result that a popular assembly was secured in North Carolina in 1677 and a few years later in South Carolina; while the «Grand Model» was formally abrogated by the proprietaries in 1693. Disputes over legislation and discontent occasioned by corrupt and oppressive conduct of some of the officials led the colonists to send an agent to London, where, after a hearing in 1720, legal process was taken for vacating the Carolina charter. Pending this process the administration of affairs was assumed by the Crown.

On the other hand, when the later colonies of Pennsylvania and New Jersey were founded an effort was made to merge the democratic institutions into the proprietary system. By his charter Penn (q.v.) was created «true and absolute lord» of Pennsylvania and given ample power of government, but «the advice and consent of the freemen of the province» were necessary to the enactment of laws. To the Crown was reserved the right of veto and to Parliament the levying of duties and taxes. Penn formed the delegates of the freemen into a council of three members from each county who were to hold their seats for three years, one being chosen each year, and an assembly of 36 members, six from each county, to be chosen annually. The governor and council were to possess jointly the right of proposing laws. Every freeman had the right of voting and holding office, the only restrictions being the necessity of a belief in God and abstinence from labor on the Lord's Day. Trial by jury was established and murder and treason alone were punishable with death. Primogeniture, with a trifling reservation, was abrogated. In 1701 a charter of privileges was framed by Penn and accepted by the assembly, the chief provisions of which were as follows: Each county was to elect annually four deputies to the assembly which should choose its officers, prepare bills and make laws; all cases relating to property were to be decided by courts of justice and not by governor and council; no law contrary to the charter could be enacted without the consent of the governor and six-sevenths of the assembly; and the proprietors and their heirs were pledged not to destroy the liberties granted by the charter. The qualification of voters was fixed at a freehold of 50 acres or in lieu of that about $166 in personal property.

In spite of every attempt to avoid a conflict of interest, it was inevitable that the proprietor must choose either one of two capacities in which he could act conscientiously — as a life tenant of certain material interests, or as a trustee for the interests of the colonists. It is true that Penn in his «holy experiment» endeavored to inject democratic features in his proprietary plan of government, but even in his case the natural conflict of interest resulted in a serious wrangle between him and his colonists; and the granting of increased governmental rights only served to aggravate the economic grievances. The settlers could not be convinced that the proprietary interests did not conflict with the interests of the colony; they would prefer to pay their quit-rents as a tax for the support of their own colonial government rather than to pay them to the proprietor in the character of a private debt. The parent government, too, regarded the proprietorships as objectionable since great difficulty was experienced in enforcing royal commands, while in the case of the acts of trade and navigation the interests of the proprietors might seriously conflict with those of the parent government. Hence the colonies gradually became royal provinces with the exception of Pennsylvania and Maryland, which were under proprietary governments at the outbreak of the Revolution; but the friction between the proprietors of the former and the people in the colony had caused almost an open rupture, and it is probable that within a short time the government would have undergone a radical change, even had not the Revolution decided the nature of the government. In both provinces, when Imperial questions were at issue, English legislation had come into a more effective control.

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IRVING E. RINES,
Author of 'History of the United States.'

COLONIAL SILVERWARE. See SILVERWARE.

COLONIAL SYSTEM. See COLONIES AND COLONIZATION.

COLONIAL WARS, Society of. The Society of Colonial Wars in the State of New York was incorporated 18 Oct. 1892. It is a patriotic organization for perpetuating the names and valor of those participating in the warfare of American colonial history. To be eligible it is necessary to have a line of descent from an ancestor: (1) Who served as a military or naval officer, or as a soldier, sailor or marine, or as privateersman, under authority of the colonies which afterward formed the United States, or in the forces of Great Britain which participated with those of the said colonies in any wars in which the said colonies were engaged, or in which they enrolled men, from the settlement of Jamestown, 13 May 1607, to the battle of Lexington, 19 April 1775; or (2) who held office in any of the colonies between the dates above mentioned, either as (*a*) director-general, vice-director-general or member of the council, in the colony of New Netherlands; (*b*) governor, lieutenant or deputy governor, lord proprietor, member of the king's or governor's council, in the colonies of New York, New Jersey, Virginia, Pennsylvania and Delaware; (*c*) lord proprietor, governor, deputy governor or a member of the council, in Maryland and the Carolinas; (*d*) governor, deputy governor, governor's assistant or commissioner to the United Colonies of New England, or body of assistants in any of the New England colonies. Membership is hereditary in the male line. The insignia of the Society is a "badge pendant by a gold crown and ring from a silk ribbon bordered with white and edged with red," a nine-pointed white star bordered with red on one side and gold on the other, on a field of blue, pendant from the crown. The flag of the Society bears a red Saint George cross on a white field.

There are more than 25 co-ordinate State societies united in the general society, with a membership approaching 5,000. In New York "business courts" are held in March and November; a "general court," for the annual election of officers, in December. At these courts papers are read dealing with the colonial period. An annual banquet is held in honor of the founding of New Amsterdam. A "general assembly" of the general society meets once in three years at such time and place as the preceding assembly designated. These general assemblies are composed of the members of the general council, together with five delegates chosen by each of the State councils.

The Society has erected commemorative bronze tablets at Fort Oswego and Ticonderoga, and one of marble to General Forbes. An oil portrait of General Bouquet has been presented to the city of Philadelphia, and adorns Independence Hall. Many members of the Society participated actively, either in the army or the navy, during the Spanish-Americar War, many thousands of dollars being contributed by the several State societies, from Maine to California, in equipping State regiments, caring for the sick and wounded, and for hospital supplies, flags, band instruments, etc. The yearbooks of the Society contain valuable historical and genealogical data.

SYDNEY H. CARNEY, JR., M.D.,
Historian Society of Colonial Wars, New York.

COLONIAL WARS IN AMERICA. A résumé of the colonial wars in America must of necessity omit many local disturbances which were of importance historically and which the student can find graphically described in many of the volumes included in the bibliography at the close of this article. Some of the most important are here chronologically presented.

1607. Jamestown, Va.— Although Capt. Gabrill Archer and a sailor were severely wounded by arrows tipped with deer's-horn and sharp stones, the night the English landed in Virginia, the first real conflict in American colonial history came two weeks after the Jamestown settlement, at the end of May 1607, 200 Indians being repulsed by the settlers under Capt. Edward-Maria Wingfield; English casualties, one killed, 11 wounded. From this encounter to the battle of Lexington (q.v.), 19 April 1775, scarcely a generation in the several colonies reached manhood without knowing the horrors of war.

1620. Plymouth, Mass.— The Pilgrims of New England had their first encounter with the dusky Nausite tribe, whose arrows were headed with hart's horn, eagle's-claws and brass, 8 Dec. 1620, and for over half a century the warfare continued with exacerbations of varying ferocity.

1622. Virginia.— Two years later their kinspeople of Jamestown escaped annihilation by the warning of a converted Indian. On 22 March at midday 347 men, women and children were slain by supposedly friendly savages, among the scattered hamlets along both banks of the river.

1633–37. Pequot War.— The Pequot Indians, in 1633, killed several English traders who came to their Connecticut River territory; 1634 found the Pequots at war with the Narragansett tribe, and hostile to the Dutch as well. Then the New England colonists prepared for the inevitable encounter. Sassacus ruled as Pequot chief. About this time John Oldham and two young lads were slain by the savages at Block Island. Governor Endicott promptly sent a force which destroyed a major part of this band. The Pequots then tried to enlist the co-operation of the Narragansetts, but this failed, owing to the influence exerted by Roger Williams over this tribe. The murder of 30 men and women followed. Connecticut, in May 1637, placed John Mason in command of troops contributed from Massachusetts and Plymouth under Capt. John Underhill, allies being Mohegans, Uncas their sachem, and 400 Narragansetts and Nyantics. The desperate battle of Pequot Hill, Groton, Conn., was fought 26 May 1637. Mason says: «Most courageously these Pequeats behaved themselves»; but, «such a dreadful Terror did the Almighty let fall upon their Spirits that they would fly from us and run into the very Flames, where many of them perished.» Nearly 800 Indians were slain in an hour; only two English were killed and 20 wounded. Activities ceased in August and the next year a treaty was concluded between the colonies and the tribes.

1642–47. Ingle's Rebellion.— Indians began to molest Europeans in Maryland in 1642 and following these attacks came Ingle's Rebellion, July 1643, aided by Clayborne, and which caused internal discord in the colony until peace was declared between contending parties in 1647.

1643–47. Kieft's War.— Kieft was appointed governor of New Netherlands in 1638. In the winter of 1643 he made war on the Mohawks, causing an outburst of hostilities among the Algonquin tribes. Massacres and conflagrations continued through the winter and following summer. John Underhill of Connecticut commanded the troops and successfully routed the Long Island tribes. In March 1644, Underhill, with 150 Dutch soldiers, landed at Greenwich, Conn., attacked an Indian village of 700, slew 180 in an hour, then set fire to the village, causing the death of 500 Indians by fire and sword. Kieft proclaimed a public thanksgiving for this victory. Nearly all Dutch farms and 1,600 Indians had been destroyed when Peter Stuyvesant succeeded Kieft in 1647 and peace was established.

1644. Virginia.— On Holy Thursday, 1644, Opechancanough and his warriors killed 500 white settlers in Virginia. Vigorous measures were taken by settlers, and the Indians were dispersed, their villages and the Powhatan confederacy (embracing nearly 50 petty tribes) destroyed, their chief captured and shot.

1648–56. New Sweden.— In April 1638 Peter Minuit, with his colony of Swedes, reached Delaware Bay. The colony was unusually prosperous, while Dutch interests there waned. Disputes arose as to titles of land; in 1648 the Dutch tried to erect a fort and houses on the Schuylkill, but were repulsed by the Swedes. Continued friction, between the two races resulted, although Stuyvesant of New Netherlands and Printz of New Sweden agreed to be, and for three years were, allies. First one side would capture a fort, then the other; until, in 1656, after discussion by the States-General and Sweden (which came to naught), the city of Amsterdam bought the West India Company's interest on the South River (Delaware), and the colony of New Amstel was launched, while the authority of New Netherlands ceased.

1660. Bacon's Rebellion. See BACON'S REBELLION.

1664–73. New Netherlands.—England seized New Netherlands, 8 Sept. 1664, and war was formally declared in March 1665. England suffered greatly at the hands of Holland in 1666, but continued to hold her American conquests. On 8 Aug. 1673 a Dutch fleet of 23 vessels, with 1,600 men, arrived off Staten Island and on the 9th anchored off the fort. The Dutch commander, Evertsen, at length opened fire, which the fort returned, but it then surrendered and the Dutch flag was raised.

1666. French and Iroquois.— The French waged war with the Iroquois and other tribes for 60 years, coming down from Canada, invading and destroying their villages. As a result, peaceful white settlers suffered from Indian retaliation.

1675. King Philip's War.— John Sassamon or Sausaman, secretary and interpreter of the Wampanoags' chief (he had been a pupil of the apostle Eliot) heard of a plot to exterminate the English and reported it to the Plymouth authorities. King Philip, second son of Massasoit, who had been chief sachem of tribes between Charles River and Narragansett Bay, was summoned and examined by the authorities. Learning of the informer, he caused his death, 20 Jan. 1675. His slayers were, in turn, executed by the authorities. Then followed a series of Indian retaliations; eight or nine whites were killed at Swansy; in June companies from Massachusetts and Plymouth drove Pokanokets from Mount Hope; Philip fled to Nipmucks, who killed Captain Hutchinson and 16 others; Brookfield was burned; Deerfield and Northfield attacked; Captain Beers and 20 men from Hadley slain; Captain Lathrop and 80 men killed at Bloody Brook, near Deerfield, which was then burned; and Springfield and Hatfield were attacked. War continued through the summer, and in October, fearing an attack from the Narragansetts, Governor Winslow with 1,000 men marched against them. All troops were assembled 18 December and on the 19th began the memorable battle, which ended in the complete rout of the once powerful Narragansetts. On 10 Feb. 1676 occurred the Lancaster massacre by the Nipmucks; and this, taken with the series of calamities at Medfield, Worcester, Marlborough, Mendon, Groton, Weymouth, Sudbury, Clemsford, Springfield, Wrentham, Hatfield, Hadley, North Hampton, Andover and Bridgewater, make an appalling list of horrors. War was actively waged by Canonchet, son of Miantonomo, until his capture by Captain Dennison and the Connecticut troops, and subsequent death at the hands of Mohegans. King Philip was killed at Bristol 12 August and the war was at an end.

1680. Port Royal, S. C.— The Spaniards from Florida attacked the Scotch settlement at Port Royal, S. C., in 1680, completely destroying it. A force of 400 men was raised to retaliate, but this plan was forbidden by the proprietors, inasmuch as the colonists were supposed to be not wholly blameless.

1687–89. French and Senecas: Montreal.— The French waged war with Senecas 1687, defeating them. Indians then destroyed Fort Frontenac. In 1689 the Iroquois attacked Montreal, causing great devastation and loss of about 1,000 French.

1689–91. Leisler's Rebellion.— See LEISLER'S REBELLION.

1690. First Intercolonial War: King William's War: Quebec.— War between England and France was declared in 1689. The French in Canada planned an attack on Boston and New York. They came down from Canada with Indian allies; attacked Schenectady 8 Feb. 1690; Salmon Falls, 27 March; horrible massacres ensued and the colonies were aroused. March 19 the General Court of Massachusetts proposed a congress, at which measures for their protection should be arranged. The several colonial bodies were notified. Representatives from Massachusetts, Plymouth, Connecticut and New York met at New York. On 1 May they signed an agreement to send 855 men for the support of Albany and, "by the help of Almighty God, subduing the French and Indian Enemies." Attempts to conquer Acadia and so move on Quebec, together with a plan to secure Montreal via Lake Champlain, followed. Acadia and Port Royal were captured by New England men under Sir William Phipps; then the force pressed on to Quebec, but not securing the desired support of Maj. Fitz John Winthrop, their object was not accomplished.

1696. Frontenac's Expedition.—Frontenac's expedition against Iroquois, Oneida and Onondaga tribes, occurred in 1696, when he was 74 years of age. The tribes were humbled by him but not subdued.

1702–10. Second Intercolonial War: Queen Anne's War.— War was declared 15 May 1702. In August 1703 the French and Indians attacked Wells, Saco and Casco. Deerfield and Lancaster also suffered. In May 1704 Col. Benjamin Church, with troops, sailed from Boston, against Acadian settlements. In 1705 French and Indians destroyed Petit Havre and Saint John's, N. F. In 1709 Haverhill was attacked by French and Indians; 16 Oct. 1710, Port Royal was captured by the English under Nicholson, and renamed Annapolis, in honor of the Queen. Varying degrees of Indian hostility were experienced along the coast to the Kennebec River, until 1725, when peace prevailed.

1703–15. Southern Wars: Charlestown.— On 15 Jan. 1703, a battle was fought between Carolina troops under Colonel Moore and the Spanish forces under Don Juan Mexia, and 800 of the latter were killed. In August 1706, Charlestown was attacked by a Spanish fleet, with small loss to either side.

1711. Tuscarora War.— On 22 Sept. 1711, Tuscaroras and Corees slaughtered inhabitants along the Roanoke River and Pamlico Sound. During several days they killed the whites along Albemarle Sound. Col. John Barnwell, with South Carolina troops and Indian allies, guided an expedition which made several attempts to drive them away; finally captured 800 in a fort; fought a severe battle 28 Jan. 1712, and killed 400 warriors. The remaining hostile Tuscaroras migrated to Oneida Lake, joining the Iroquois confederacy.

1714–15. Yemassee War.— The Yemassee War was instigated, so it is claimed, by the Spaniards. A series of Indian outbreaks occurred in 1714–15, in one encounter 400 South Carolinians being killed. The Yemassees were driven out of Carolina into Florida, but disastrous warfare continued, hundreds suffering brutally at the hands of savages.

1739–48. War with Spaniards in Florida: War of Jenkins' Ear: Carthagena.— The English South Sea Company, under the Treaty of Utrecht, was permitted to supply slaves to Spanish colonies. A smuggling-trade developed, which a Spanish fleet (*guarda costa*) tried to discourage. England and her colonies heard of terrible severities imposed by Spaniards on suspects captured. Runaway slaves from South Carolina made their way to Florida, were well received, protected and given grants of land by the Spaniards, who declined to return slaves. In 1738 Oglethorpe, appointed military commander of Georgia and South Carolina, returned from England with a regiment. The same year, Captain Jenkins, skipper of the ship *Rebecca*, was examined in the House of Commons. He described how, having unjustly accused him of smuggling, the Spaniards first hung him at the yardarm, then lowered him, and cut off his ear, telling him to take it to his king. Public clamor caused Walpole to declare war 23 Oct. 1739. An English fleet under Admiral Vernon visited the Isthmus of Darien, and captured Porto Bello. Oglethorpe, having perfected a treaty with the Creek Indians, called on them and South Carolina for aid. Although an expedition captured Fort Picolata (thus preserving navigation of Saint John's River, and preventing Spaniards communicating with posts at Saint Mark's and Pensacola), Oglethorpe found the 1,200 men under his command unable to make any impression on Saint Augustine, and gave up the siege of that place after heavy loss to his Highland regiment, and desertion of Indians and some Carolina troops. In the spring of 1741 Admiral Vernon, co-operating with land forces under General Wentworth, failed in an assault on Carthagena. A fleet under Commodore Anson secured several valuable Spanish prizes. The Peruvian town of Paita was destroyed. In 1742 a Spanish fleet of 56 vessels, carrying 7,000 or 8,000 men, fitted out at Havana, and appeared off the Georgia coast at the end of June. Its attempts to capture the island of Amelia and forts at Frederica were frustrated by General Oglethorpe on 7 July 1743, and the Spaniards lost heavily at the battle of Bloody Marsh; 24 July

Oglethorpe proclaimed a general thanksgiving for the end of the invasion.

The following reproduction of the governor's speech to the general assembly of his majesty's colony of New York is of interest. It is for the first time reproduced from the only known copy, in possession of the New York Historical Society, and bears upon this period of martial activity, giving an idea of the style of appeal from king to colonists.

Journal of the Notes and Proceedings of the General Assembly of His Majesty's Colony of New York, 30th Day of June 1740.

Gentlemen: His Majesty having been called upon, by repeated Provocations, to declare War against Spain, and being determined, by God's Assistance in so just a Cause to Vindicate the Honor of His Imperial Crown, to Revenge the Injuries done to His Subjects, to Assert their undoubted Rights of Navigation, and by all possible Means, to Attack, Annoy, and Distress a Nation that has treated His People with such Insolence and Barbarity, has given Orders for the Equipping and setting forth an Expedition against the Territories of the Catholic King in the West-Indies, which will consist of a large Squadron of Ships of War, and of a considerable Body of Land Forces, with a suitable Train of Artillery, Store-ships, and all Things requisite: and has likewise given Orders to raise the Body of Troops in His Majesty's Colonies on the Continent of North America, to join those to be sent from England, at a particular Rendezvous. I have, in Obedience to His Majesty's Commands, taken the best Measures in my power, to invite and encourage in His Majesty's faithful Subjects in this Province, chearfully to enlist in His Majesty's Service for this Expedition: But it is in your Power to do much more, by giving a Bounty to every Man who enlists in this Service. And I am perswaded it will be such as will shew the World, that you will not be behind the most Zealous of His Majesty's Subjects, in promoting this Glorious Enterprise. Now, although by the Success of this Expedition, the Commerce and Navigation of this Province, to and from the West-Indies, will not only be secured, but greatly increased by the large Possessions which, by the blessing of God on His Majesty's Arms, will fall into his Majesty's hands; And although by such acquisitions a Door will be opened for a larger Consumption of Provisions (the Staple of this Province) whereby the Farmer, as well as the Merchant, may be greatly enriched, Yet, it is but little that His Majesty expects from his Dutiful and Loyal Subjects of this Province, towards the Expense of this Expedition. And I am commanded by His Majesty, to Recommend it to you, in His Name, as I do most earnestly, That you provide Victuals, Transports, and all other Necessaries for the Troops to be raised in this Province, except Cloathes, Tents, Arms, Ammunition and Pay till their arrival at the general Rendezvous in the West-Indies from which Time the Said Transports are to enter into His Majesty's Pay. In the doing whereof, I hope you will loose no Time, that the Expedition may not be retarded His Majesty's Expectations are so just and reasonable, and the Prospect of Advantage to the Province so clear, that I perswade myself, you will chearfully and immediately provide for the Expence of what is recommended to you. These Things being Matter of the highest Importance, I will not now take off your Attention, by Recommending anything else to your Consideration, hoping you will give this Business the utmost Dispatch, wherein you will, in a very particular manner, Recommend yourselves and your Country to His Majesty, Whom God long Preserve.

George Clark.

A bill covering the above passed the assembly 10 July 1740, and Colonels Morris and Philipse carried the same to the council for its concurrence. It was passed by the council 11 July and signed by the lieutenant-governor 12 July.

1744–48. Third Intercolonial War: King George's War.— On 13 May 1744, Governor Duquesnel of Cape Breton captured an English settlement on the island of Canso, near Nova Scotia; destroyed the fort, removing all prisoners to Louisburg; but was unsuccessful in an attempt against Annapolis, N. S., and Placentia, N. F. New England colonists declared war on Nova Scotia Idians, who attacked Annapolis and planned the capture of Louisburg. Men, money and supplies were contributed by Pennsylvania, New Jersey, New York, Connecticut, Rhode Island and New Hampshire, but the chief burden was imposed on Massachusetts. Command of the forces (some 4,000 men) was given to William Pepperell, who left Boston in April 1745, Commodore Warren, commanding in the West Indies, furnishing ships of convoy. Five assaults were made on an island battery protecting the harbor before the French surrendered, 17 June. For this success Pepperell was made a baronet. An expedition the following year proved unsuccessful and Louisburg was returned to the French by the Treaty of Aix-la-Chapelle, 7 Oct. 1748.

1754. Great Meadows.— In December 1753 George Washington carried a request from Governor Dinwiddie of Virginia to the French commander of Forts Venango (confluence of French Creek and Allegheny River, now Franklin, Pa.) and Le Bœuf (west fork of French Creek, now Waterford, Pa.) that he retire from territory claimed by the English; request was refused. Governor Dinwiddie then ordered a fort constructed at the forks of the Ohio, and while work was in progress the French appeared and the English retired. A regiment organized under Col. Joshua Fry, with Washington second in command, pushed on with 150 men. On 28 May 1754, when near Great Meadows, the French were met in a glen. In ensuing hostilities the French commander, Jumonville, was killed and those under him captured. Washington retired to Great Meadows and threw up entrenchments, awaiting Colonel Fry's force, which finally arrived. Colonel Fry had died suddenly. Washington made a second advance, which proved ineffectual against a French force of 700, and he retired with the honors of war, 3 July 1754.

The same month Benjamin Franklin, Thomas Penn and others assembled at Albany by request of the «Lords of Trade» (a standing committee of England's privy council), hoping to make an agreement with the chiefs of the Six Nations for protection in the event of further hostilities with France. Franklin's plan was unanimously approved at this congress, but the several assemblies failed to ratify it. Had his plan been adopted, it is said, the several colonies would have been united and strong enough to withstand attacks from enemies without England's assistance and the later pretense for unjust taxation. Thus the Revolutionary struggle might have been averted.

1755–63. Seven Years' War: French and Indian Wars: Braddock's Defeat.— The English government, in 1755, placed General Braddock over a force intended to drive the French from the Ohio Valley. Washington was on his staff. Braddock planned the capture of Fort DuQuesne, at the confluence of the Allegheny and Monongahela rivers. Untrained in methods of frontier warfare, having seen no enemy on his tedious march (2 April to 9 July), Braddock scoffed at the employment of scouts as he approached the immediate vicinity of the enemy, with the result that when his command was attacked it was completely defeated, half his 1,600 men killed or wounded and he himself died from a wound received in the onslaught. His papers were captured by the French, who found therein all the English plans.

1755. Battle of Lake George.—At a council of war, called by General Johnson at early morning 8 Sept. 1755, it was proposed to send 500 men to Fort Edward. The noted Indian King Hendrick, when consulted about this number, said: "If they are to fight they are too few; if to be killed, they are too many." The force was doubled. Johnson then proposed dividing it into three parties. Hendrick took several arrows, handed one of them to Johnson, requesting that he break it, which the general did; Hendrick then placed three arrows in the general's hand, saying: "Put them together and you can't break them; take them one by one and you will break them easily." This argument was conclusive. Col. Ephraim Williams led; Lieutenant-Colonel Whiting had the second division; King Hendrick, with 250 Mohawks, was in advance of the Provincials. Rocky Brook was reached; here the enemy was in ambush; but for friendly warning from Senecas, the troops would have perished. Colonel Williams and King Hendrick lost their lives; General Johnson was wounded; Lieutenant-Colonel Whiting conducted a successful retreat, followed by the French and Indian allies. Lieutenant-Colonel Cole, with 300 men, came from Lake George; a brilliant dash was made on the enemy, driving them and capturing Baron Dieskau. Colonel Blanchard advanced from Fort Edward, where the firing had been heard, with 250 men; discovered 300 Indians resting at Rocky Point; slew most of them. Among 500 lost by the French was Le Gardeur de Saint Pierre, whom Washington had met the year before at Great Meadows.

1756–57. Forts Oswego, Ontario, George and William Henry.— England declared war against France 18 May 1756. Governor Shirley was commander-in-chief of colonial forces; Marquis de Montcalm general of French. Shirley slowly matured plans of attack on Crown Point and Fort DuQuesne; meanwhile Montcalm destroyed three forts, Oswego, Ontario and George. This activity of the enemy cost Shirley his position, the Earl of Loudon taking his place, General Abercrombie second in command. In 1757 Montcalm attacked Fort William Henry, at the head of Lake George, garrisoned by 2,264 regulars, under Colonel Munroe. The attack lasted from 3 August to 9 August, when a capitulation was signed.

1758. Louisburg: Ticonderoga: Crown Point: DuQuesne.— Three expeditions were proposed for 1758: the first against Louisburg; the second against Ticonderoga and Crown Point; the third against Fort DuQuesne. May 1758 found Admiral Boscawen at Halifax with a fleet of 157 vessels (23 ships of the line, 18 frigates and transports). There were 12,000 men under Jeffery Amherst to co-operate with him. The attack on Louisburg began 9 June and lasted until 26 July, when the garrison capitulated, becoming prisoners of war. Vast quantities of ammunition and stores, 218 cannon and 18 mortars fell into the hands of the English.

General Abercrombie led a force of 15,000 men against Ticonderoga, embarking on Lake George 5 July; advanced toward the fort; experienced many difficulties, including a skirmish in which Lord Howe was killed, and finally had to retreat. He lost about 2,000 men.

Lieut.-Col. John Bradstreet proposed an attack on Fort Frontenac (now Kingston, Canada); Abercrombie consented and gave him 3,000 men. This was successful toward the close of August; Bradstreet captured quantities of stores, ammunition and cannon.

DuQuesne.— Early in July General Forbes left Philadelphia en route to Fort DuQuesne, with Cherokee allies; Colonel Bouquet was at Raystown; in September Colonel Washington joined Forbes; late in November Fort DuQuesne was in possession of colonial forces, receiving the name of Pittsburgh in honor of the elder William Pitt.

1759. Quebec.— Maj.-Gen. James Wolfe was appointed to proceed against Quebec. He had 10 battalions of infantry, 6 companies of rangers, artillery, engineers and the Louisburg Grenadier Corps. Under Admiral Saunders were 22 ships of the line, 5 frigates and several transports; Wolfe had, as brigadier-generals, Monckton, Townshend and Murray; Col. Guy Carleton commanding the grenadiers, and Lieut.-Col. William Howe (brother of Lord Howe) the light infantry. At Quebec were more troops than the English had, under Montcalm, who placed them along the north shore, below the city, from Saint Charles River to the Falls of Montmorency. Wolfe placed batteries within cannon-shot of Quebec at the west point of the Isle of Orleans, and at Point Levi. The lower town was destroyed; conflagrations occurring in the upper town from red-hot balls and shells. Wolfe crossed from the Isle of Orleans to the north branch of the Saint Lawrence 9 July, camping below the Montmorency; 18 July he made a successful reconnoitre. His attack on redoubts at the ford was unsuccessful, with a loss of 400 men and two vessels. While ill, and waiting the arrival of General Amherst, he called a council of war; and it was decided to draw Montcalm into the open field. Camp was broken and the troops moved to Point Levi.

De Bourgainville, with 1,500 French, guarded the north shore to prevent landing. The English admiral deceived the French by moving his vessels below the real landing-place (Wolfe's Cove, near Cape Diamond). Ascent was made to the Plains of Abraham; the memorable battle was fought, Wolfe and Montcalm both dying from wounds therein received; and the citadel surrendered 17 September to General Townshend.

Fort Niagara.— Soldiers under Prideaux landed 1 July 1759, within six miles of Fort Niagara. A sally was made 11 July. Prideaux was killed by a bursting shell 19 July; Amherst appointed General Gage to succeed him; until his arrival General Johnson carried on a siege; the fort surrendered 25 July.

Presqu' Isle: Venango: LeBœuf: Ticonderoga.— Colonel Bouquet captured with ease Presqu' Isle, Venango and LeBœuf. General Amherst had 11,000 men for an attack on Ticonderoga, which he took late in July (the French having withdrawn), only losing 75 men in a skirmish. He also took Crown Point. The English now fortified these places.

1759–60. Cherokee War.— While the above events were transpiring trouble arose with the Cherokees, who had accompanied General Forbes against Fort DuQuesne the previous year. On the return of the Cherokees numerous instances of loss of life occurred between Indians, Virginians and Carolinians. Governor Littleton, with 1,500 men, marched against the

Cherokees, demanding surrender of the murderers; he received 22 Indian hostages as security for peace, and retired from the field owing to disease and insubordination in his command. The Cherokees attempted to take Fort Prince George, at the head of the Savannah. Hostages were placed in irons through fear of an effort to release them; one of them wounded a soldier, and his friends promptly killed all the Indians. This enraged the Cherokees, and war-parties were sent out in every direction and laid siege to the fort; the South Carolina assembly offered £25 for each Indian scalp, and voted to raise 1,000 men. General Amherst sent 1,000 Scotch Highlanders under Colonel Montgomery, who raised the blockade at Fort Prince George, and met Indians in June 1760. Victory was claimed by both sides. Montgomery retired to Charlestown, prepared to return north, by order of General Amherst. Lieutenant-Governor Bull now ordered 400 regulars for frontier protection. Upper Cherokees besieged Fort Loudon so successfully that the garrison lived on horse-flesh until it surrendered under promise of protection to the settlement; the promise was broken, many lives lost and many taken prisoners. In June 1761 the Highland regiment returned and defeated the Cherokees with great slaughter. They sued for peace, which eventually was concluded.

1760. Quebec.— The delay caused in rebuilding and strengthening Ticonderoga and Crown Point prevented Amherst from moving on Montreal. The French had time to rally under De Levis, who succeeded Montcalm, and planned retaking Quebec. The plan was put in operation 17 April 1760. De Levis with 10,000 men went down the river to Quebec, where Murray was in control. De Levis camped three miles from the city. On 28 April an attack was made, in which Murray lost 1,000 men and a train of artillery. The French loss was estimated at 300. De Levis built trenches about the city, preparing for a long siege. Swanton arrived 15 May and destroyed all the French ships at Quebec. The siege was raised 17 May and on 8 Sept. 1760, the English flag was raised in Montreal.

1762. Martinique: Havana.— General Robbert Monckton sailed from New York late in 1761 with two line-of-battle ships, 100 transports and 12,000 regulars and colonials; in February 1762 he captured Martinique; next, Fort Royal, Saint Pierre, Saint Vincent, Grenada and Saint Lucia surrendered; the French fleet was destroyed; on 12 Aug. 1762, Havana was captured by forces under the Duke of Albemarle, after a fierce struggle of 44 days, and great loss of life.

1763–64. Pontiac's War.— Pontiac, chief of the Ottawas, posed as friend of the English after their victories; in secret he was plotting against them with Algonquins, Wyandots, Senecas and others. He planned simultaneous attacks on Western posts in the spring of 1763. Major Gladwin, commanding at Detroit, was forewarned, and when Pontiac and his 60 chiefs appeared on 6 May, they found the garrison under arms. The fort was unsuccessfully attacked for two months; then relief came from Fort Niagara. Captain Ecuyer at Fort Pitt (Pittsburgh, Pa.) was also prepared. At the first attack, 22 June, the Indians were repulsed. The second attack, 26 July, lasted four days, and the Indians were defeated. General Amherst sent Colonel Bouquet with 500 men to its relief; while en route, 25 miles east of the fort, he fought a stiff battle with Indians at Bushy Run, coming off victorious. In September 1764 Colonel Bouquet was again at Fort Pitt. Toward the close of November the Delawares and Shawnees returned 200 captive whites. This border war had caused much distress, and the following forts had been lost before Sir William Johnson and Bradstreet successfully treated with 2,000 representatives of the Ottawas, Ojibways, Iroquois and Wyandots at Fort Niagara, and Pontiac's war was over:

May 16, 1763, Fort Sandusky.

May 25, Fort Saint Joseph (at the mouth of Saint Joseph River, Mich.).

May 31, Fort Onatanon (on the Wabash, Lafayette, Ind.).

June 2, Fort Michillimackinac (Mackinaw, Mich.).

June 17, Fort Presqu' Isle (Erie, Pa.).

June 18, Forts Le Bœuf (Erie County, Pa.), Venango (Venango County), and forts at Carlisle and Bedford, Pa.

1774. Lord Dunmore's War.— When Lord Dunmore was royal governor of Virginia in 1774, dissension as to boundary lines arose between Virginia and Pennsylvania, as well as to ways and means of dealing with Indians. Virginia wished to possess their lands; Pennsylvania desired their trade; as whites encroached more and more on lands, Indians became angered; outrages followed, perpetrated by Shawnees, Mingos, Cherokees, Wyandots and Delawares. In the spring of 1774 a ruffian borderer, Greathouse, killed nine kinsmen of the Iroquois Logan. This caused continued hostilities until the battle of Great Kanawha, or battle of Point Pleasant, in October. The effect of this battle kept the northwest Indians submissive during the early years of the Revolution, and at the same time permitted settlement of the Kentucky regions.

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COLONIES AND COLONIZATION. In the older and stricter sense, a colony is a body of people who, having migrated and settled beyond the borders of their native country, retain a political connection with the parent state. Since, however, the colonists may be mingled in any proportion with the natives, it is impossible to maintain a firm distinction between colony and dependency. It has therefore become customary to apply the term «colony» to an outlying possession of a national state the administration of which is carried on under a system distinct from but subordinate to, the government of the national territory. According as the dominant feature is the exploitation of a dependent population, the settlement of immigrants from the mother country or the investment of capital, colonies may be divided into possessions, settlement colonies and investment colonies.

The Greek colony was formed in a natural way by the swarming off of surplus population, and was usually independent from the beginning. The bond between the mother state and the colony was sentimental, not political, and the former seldom expected any advantage from the founding of the colony save relief from the pressure of population. The Roman colonies formed part of an elaborate scheme for extending Roman dominion. They were instituted by the state, and were its chief instrument in confirming its conquests. In their origin they were little more than garrisons in conquered, forfeited places, where land was allotted to the soldiers instead of pay and provisions.

When the discovery of America occurred, Europe was not overpeopled, and there was for a long time little spontaneous outflow of substantial elements to create new communities. The conquest of large and industrious populations, settled upon rich lands, tempted the cupidity of rulers, and gave rise to the conception of the colony as a possession, an estate to be mined or worked by the state or its favorites for purposes of revenue. Says Seeley: «A native population reduced to serfdom, in some parts driven to compulsory labor by caciques turned into state officials, in other parts exterminated by overwork and then replaced by negroes; an imperious mother country drawing from the colony a steady revenue and ruling it through an artful mechanism of division, by which the settlers were held in check by the priesthood, and by a serf population treated paternally, that it might be available for that purpose; such was the typical colonial system.»

The exploitation of subject populations by such means as tribute, serfdom, forced labor on public works and government plantations, or the maintenance of Crown or company monopolies, has come to be generally recognized as short-sighted, and no longer commends itself to enlightened nations. The old, harsh policy has, moreover, become more difficult with every step toward popular government in the dominant country, and every increase in the power of public opinion.

Entirely different from the type just described is the settlement colony, which grows up in desirable temperate regions, vacant or sparsely peopled by savages. Although the love of adventure, the crusading spirit and the desire to escape political, religious or racial oppression are by no means to be overlooked, it is chiefly the economic motive that leads to the founding of settlement colonies. A stationary population enjoying rapid industrial expansion yields few colonists, but a clogged labor market, a narrowing circle of opportunities and a darkening prospect stimulate large numbers to face the unknown in the hope of bettering their condition. Not only is a population stimulated to its utmost capacity, provided it remains in vitalizing touch with the mother country, but the mixture of races results frequently in a beneficial crossing of stocks, and the severe struggle in a new and untamed environment accelerates the improvement of the race by natural selection. The growth of numbers, changing constantly the relation between population and opportunities, carries a colony through well-defined stages. First comes the appropriation of natural wealth, hunting, trapping and mining; then follows pastoralism; then agriculture, to which in time is added manufacturing. During the earlier stages, when the colony is complementary to the mother country, each finds in the other a convenient vent for its surplus products. The volume of exchanges is relatively large, and their trade reaches its maximum importance. But as population thickens and wealth accumulates, the colony, acquiring home manufactures and home markets, becomes an integral, self-sufficing community, and evinces a growing disposition to assert its independence of the mother country, formerly its complement, but now its competitor.

The granting of large entailed estates may lend a colony a semi-feudal character. But if the land system is popular, landed property will be diffused, the proceeds of labor will go to the producer and the colony will contain few persons living on incomes derived exclusively from ownership. Moreover, being more favorable to production than to consumption, the colony will draw to itself adult males from the industrial population of the mother country, but will attract few members of the less active classes. Since the reward of industry is greater than in older societies, and the community is but little differentiated, economically or socially, manhood rather than property controls the body politic, the temper is individualistic and liberty-loving and the conditions favor the germination and rootage of democratic ideas. Despite its social and political radicalism, the colonial society is conservative in its moral and religious ideals. Unless non-economic motives have presided over the beginnings of the colony, the pursuit of wealth is the chief interest of the settlers, and there is little room for speculative thought. The lack of cities, of intercourse and of leisure is unfavorable to the cultivation of the sciences or the fine arts. During the early life of the colony the preoccupation with private affairs leaves little margin for public life. If the mother country is wise enough to establish security without interfering vexatiously with private interests, the administration of affairs of general concern is turned over to it without regret. A dependence upon the richer and riper culture of the parent state may indeed cause the political connection to continue long after the colony is ready for self-government. Lands thickly peopled by non-European races, and tropical regions where the climate is such that white men will not settle there with their families, do not develop into settlement colonies. Unfit to serve as an outlet for the surplus population of the temperate zone, they can be legitimately utilized by the more advanced races only as a field for the employment of commercial or industrial capital.

The commercial type of the investment colony is best seen in the early establishments of Portugal, Holland and England, for trade with the East Indian and African peoples. When colonial enterprise is dominated by the commercial motive, penetration of the interior of a new region is not required. Trade is conducted from the decks of merchantmen, from hulks anchored at the mouth of streams or from fortified stations situated on the sea coast or on the banks of navigable rivers. Settlements of traders and soldiers spring up, but there is little motive to extend political control over large inland regions. A chartered commercial company has at first no occasion to clash with the natives. Its armament is chiefly directed against envious rivals, eager to share in its lucrative trade. Later, when in its eagerness for an exorbitant profit, it attempts to dictate to the natives or limit their production of the staples of trade, it comes to blows with them, and squanders its resources in profitless wars. The earlier commercial colony was valued as a source of tropical products, such as sugar, coffee and spices, which could be resold in Europe at a large advance. Since the advent of machine industry, however, the commercial colony is valued rather as a market for surplus manufactures.

The chief means of relieving the superabundance of capital that threatens to lower the rate of profits in the advanced countries is the application of capital in the industrial development of the more backward regions. Tropical lands under native systems are almost invariably underexploited from the point of view of modern industry. The forest and mineral wealth is largely untouched, and even the area under intensive native cultivation, lacking as it does the best facilities for irrigation, tillage and transportation, produces by no means the value it might yield. Owing to ignorance, to unstable conditions or to the lack of accumulated wealth, industry is almost wholly deprived of the aid given by large applications of capital. Under these circumstances it is possible for the more civilized peoples, without in any way exploiting the native populations, without depriving them of their earnings or their patrimony, to apply capital and directive skill in such a manner as to reap a generous profit.

The example of Mexico and of certain countries of South America shows that backward regions may be developed by capital invested under the protection of local governments, and that no adequate reason exists for administering these countries from a distance. In other cases, however, a rapacious and unstable native rule paralyzes industry, and the utilization of natural resources is impossible until a responsible and equitable government has been instituted. It is necessary for some civilized power to suppress tribal and local warfare, to stamp out brigandage and to establish an efficient police, a righteous administration of justice and a rational system of taxation. When order and stability have thus been assured, the next step is the investment of development capital in the form of harbors, railways, highways, telegraphs, improved natural waterways and irrigation works. As the means of communication are perfected, there follows naturally the employment of capital in the opening of mines, the cutting of forests, the clearing and planting of estates, and, possibly, the establishment of factories. The development of a tropical region by the aid of capital from abroad requires the presence of a small body of white men in the capacity of officials, traders, planters and superintendents, representing in the midst of the less advanced population the superior power and intelligence of the civilized peoples.

The extension of modern forms of agricultural exploitation into climates where white men cannot endure heavy field-work creates special problems respecting the relations of capital and labor. Successful enterprise requires an abundant supply of suitable and reliable labor, and this can come only from the natives or from other colored races. In the old plantation colony the problem was solved by enslaving the local population, or by kidnapping negroes from Africa. Owing partly to the racial inequality of employer and employee, and partly to the character of tropical agriculture, which cannot bear interruption, especially at harvest-time, there is a strong tendency in all planting colonies to compel the specific performance of the labor contract. Under the indentured labor system in the British colonies strikes are unlawful, and refusal to work can be punished; on the other hand, the government closely supervises the terms of the labor contract, suppresses all obnoxious features and provides machinery for compelling the fulfilment of its provisions by the employer.

If the welfare of the colony is the first desideratum, the degree of control exercised by the mother country over the internal affairs of a settlement colony will be moderate at the beginning, and will tend constantly to diminish. The prosperity of the English colonies in America was largely due to the salutary neglect of the mother country. They revolted when she sought by a stricter control to make them subserve her economic interests. The home government, even with the best of intentions, is likely through sheer ignorance to press upon the colony institutions ill-adapted to local conditions. On the other hand, during the early life of the colony, the settlers, preoccupied with private affairs, have little leisure for the study of the problems of administration and government. Their political life is unduly dominated by selfish, special interests, and there is danger that the first comers may monopolize or waste the natural wealth which ought to be reserved for later arrivals. As impartial umpire and as custodian of the interests of the future, the home government may wisely exercise a supervision which will diminish as the colonial society grows in mass, stability and variety of interests. In the final stage of political connection, the colony is granted autonomy in all save external affairs, or even becomes with the mother state a member in a federal empire. On the other hand, this gradual ripening off the parent stem is by no means the normal course of a tropical colony, where there are two unmingling elements in the population — a colored race and an incoming European race. In the West Indies, for example, self-government means the rule of the one race or the other. There is either the domination of a large native population by a permanently resident European caste, cut off from the moral and political conditions which have produced European standards, or else the subjection of the white element to the uneducated and politically inefficient majority race. Here, the home government presents itself as a power superior to local prejudices and able to override the antagonistic class or race interests which otherwise might wreck the prosperity of the colony. For these reasons the system of self-government now enjoyed by the colonies of Canada and Australasia is not likely soon to be extended to the remaining 500,000,000 human beings in existing colonies, dependencies and protectorates.

COUNTRIES HAVING COLONIAL OR NON-CONTIGUOUS TERRITORY	Number of colonies, etc.	Area		Population	
		Mother country	Colonies, and other non-contiguous territory	Mother country	Colonies, and other non-contiguous territory
		Square miles	*Square miles*		
United Kingdom	55	120,953	*12,043,806	46,052,741	*391,582,528
France	29	207,076	4,110,409	39,602,258	62,350,000
Germany	10	208,830	1,230,989	64,925,993	13,074,950
Netherlands	8	12,761	782,863	6,102,399	37,410,000
Belgium	1	11,373	910,000	7,571,387	15,000,000
Chinese Empire	5	4,287,000	2,786,000	421,000,000	19,000,000
Turkey	5	204,682	489,060	11,066,000	8,250,000
United States	6	3,026,789	125,610	98,781,324	10,020,982
Portugal	8	35,500	804,440	5,960,056	9,680,000
Japan	5	140,191	95,689	50,052,798	15,965,000
Russia	3	8,770,703	115,000	173,359,900	3,500,000
Austria-Hungary	1	261,037	19,760	51,390,223	1,932,000
Italy	4	110,623	591,250	35,238,997	1,396,176
Spain	6	197,700	24,021	19,588,688	1,167,645
Denmark	4	15,042	90,586	2,757,076	125,143
Total	150	17,640,260	24,221,481	1,033,449,840	599,454,424

*Includes feudatory states of India, whose area is 731,944 square miles: population, about 70,000,000; also, since the annexation in 1914, Egypt, area, 363,181 square miles, population, 11,300,000.

The method of direct administration — known as «the Crown colony system» — while excellent as a means of balancing conflicting interests and protecting the native majority against oppression by the white minority, errs in trusting too much to the power of ordinance, and showing too little deference to the deeply ingrained customs and characteristics of the native population. The direct government of an alien race by European officials is, moreover, very expensive; and if it is sought to utilize natives as magistrates and police, the best among the native leaders will stand aloof, leaving often only the riffraff to become the instruments of administration. Provided there exists an advanced civilization and a highly organized native society, the legitimate ends of European control over a tropical region can best be attained by preserving and working upon the native government through the instrumentality of a protectorate. By this method the natives continue to follow their natural leaders and retain their time-hallowed laws and customs. Resident agents of the suzerain country supervise the native authorities and, by the exercise of personal influence, prevent misrule, suppress obnoxious practices and introduce gradually the standards of civilized administration. Commercial and industrial development proceeds apace, while the local population is better safeguarded against exploitation.

The present century has seen a marked increase of political dependency. Strong nations have evidenced a growing disposition to police and place under orderly administration all regions where potential wealth exists, in order to make safe and profitable the improvement of such resources by means of the capital and skill of their citizens. The investment motive is likely to become in the future even more imperious than now, and the increasing speed of communication favors the permanence of the colonial relation where once it is established. In fact, in the more advanced nations a larger and larger share of attention is devoted to colonial affairs and problems. See COLONY.

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COLONIZATION SOCIETY OF AMERICA, The National. An association to colonize free negroes in Africa or elsewhere. The idea was evolved by friends of negro advancement and opponents of slavery. Dr. Samuel Hopkins, of Newport, R. I., in 1770 suggested the Christianizing and civilizing of Africa and the assisting of emancipation here by providing a place to which free negroes could go; and this was proposed by Jefferson during the Revolution. But about 1800 it was taken up by the slaveholding interests, for exactly the opposite purpose — to strengthen their system by deporting the free negroes, who made the slave discontented and were considered otherwise objectionable. Virginia tried repeatedly to obtain a national grant for colonizing purposes, and failing this, in 1806 enacted that any slave thereafter free should leave the State within a year or be again reduced to slavery; and in 1816 the petition to Congress was renewed, to force some national action. On the first of January the society above was organized. The president (Judge Bushrod Washington), all the managers and all but a small minority of the vice-presidents, were slave holders; its constitution professed no purpose to benefit the blacks, and its ablest Northern advocate denied that it had any. Support was asked for it in the North on the ground of its civilizing Africa and leading to gradual emancipation; in the South, on the ground of its contributing to the continuance and strengthening of slavery, augmenting the value of slave property and providing an overflow for the excess of slaves beyond profitable employment. This impossible “straddle” of purposes ruined its chance of accomplishing much; though a number of the best Northern philanthropists, and their Southern peers like Birney, clung to it for some years and hoped for good from it. A great many State branches were organized and vigorous public appeals made for it. Charles Carroll, James Madison, Henry Clay and Latrobe the architect were its presidents. In 1820 a colony of a few hundreds was sent to Sherbro Island, West Africa, with tools and arms, and in 1822 another was sent to found Liberia, with sincere hopes. But the perpetual vilification of the free negroes by the managers, advocates and organs of the Society, their anxiety to do nothing to antagonize the slaveholders and their advocacy of the severest “black laws” to force the freedmen into desiring deportation as a refuge, alienated the anti-slavery element, who felt that they were being used as cats'-paws of the slave interest. Even Daniel Webster in 1825 refused to join it on that ground, though in 1822 he favored it. By 1830 the Tappans, Gerrit Smith, Birney, Lundy, Garrison and others had withdrawn from it, and the last-named was openly denouncing it. In 1833 he went to England to expose it before the anti-slavery people there, and they united in a public protest against it. A similar society was organized there, but accomplished nothing. The American society maintained its organization even after the War, though its problem was altered, as well as the Southern attitude toward it. An effort a few years since to promote a large negro emigration to Kansas or Oklahoma was met with strong objection from Southern employers of labor. Consult Wilson, ‘Rise and Fall of the Slave Power in America’ (Vol. I, Chap. 15); Alexander, ‘History of Colonization on the West Coast of Africa’ (Philadelphia 1846); Birney, ‘Letter on Colonization’ (New York 1834); Jay, ‘Inquiry into the Character and Tendency of the American Colonization and Antislavery Societies’ (ib. 1834).

COLONNA, kō-lŏn'nä, **Aegidius de**, Italian scholastic theologian: b. 1247; d. 1316. He was prior-general of the Augustine order and an ardent realist and disciple of Saint Thomas Aquinas, under whom he studied at Paris.

COLONNA, Fabio, Italian botanist: b. Naples 1567; d. there about 1650. He published several botanical works and is classed as the founder of genera in botany.

COLONNA, Fabrizio, fä-brēt'sē-ō, Italian general: d. Naples 1520. He was the cousin of Prospero Colonna (q.v.) and father of Vittoria, served in the army of Charles VII of France in 1494; in that of Frederick, king of Naples, in 1497; and afterward in that of Ferdinand the Catholic, by whom he was made grand constable of Naples in 1507. Subsequently he served in the papal army under Julius II. In 1512 he was made prisoner at the battle of Ravenna by Alfonso d'Este, Duke of Ferrara, who treated him with distinction and dismissed him without ransom. To show his gratitude he tried to reconcile Alfonso with the Pope and gave him a safe conduct to come to Rome, but Julius kept him prisoner and attacked his states. Colonna, indignant at this breach of faith, rescued Alfonso from the papal troops and reconducted him to Ferrara.

COLONNA, Marco Antonio, Italian commander: b. 1535; d. 1 Aug. 1584. He commanded the papal forces at the battle of Lepanto and was subsequently viceroy of Sicily.

COLONNA, Ottone. See Martin V, Pope.

COLONNA, Pompeo, pŏm-pā'ō, Italian ecclesiastic, nephew of Prospero Colonna (q.v.): d. 1532. He was a restless and intriguing Roman cardinal who quarreled in succession with the popes Julius II, Leo X and Clement VII, and had part in all the troubles of the court of Rome. When Clement VII was the prisoner of the Constable de Bourbon, Pompeo exerted his influence for his liberation. He at length became viceroy of Naples.

COLONNA, Prospero, Italian general: b. 1452: d. 1523. On the invasion of Italy by Charles VIII he took part with that prince, owing to his enmity against the Orsini family. He shortly afterward, however, abandoned the French cause and bore arms in the Spanish interest. Among his most noted victories were those gained at Vicenza over the Venetians, 1513, and at Bicoque over the French, 1522. He also took Milan from the French in 1521, and Genoa in 1522. In 1523 he defended Milan successfully against Admiral Bonnivet.

COLONNA, Vittoria, Marquise of Pescara, Italian poet: b. Marino at Marino castle near Naples 1490; d. Rome, 13 Feb. 1547. She was the daughter of Fabrizio Colonna (q.v.) and when four years old was betrothed to a boy of the same age, Fernando d'Avalos, son of the Marchese di Pescara. At 17 they were married. After her husband's death in the battle of Pavia (1525) Vittoria found her chief consolation in solitude and the cultivation of her poetical genius. For seven years she resided at Naples and Ischia, then removed to the convent of Orvieto and afterward to that of Viterbo. In her later years she left the convent and resided in Rome. Her earlier poems were chiefly devoted to the memory of her husband. Among her later verse the ‘Rime Spirituali’ (1548) is remarkable for truth of sentiment and enlightened piety. Her work is of importance on account of the influence it had on the literary movement in Italy in the 16th century and consequently on that of succeeding centuries. In her day she was called «Victoria the Divine,» and the first edition of her works published in 1538 bore the significant title ‘Rime della divina Vittoria Colonna.’ Since then many editions of her works have been issued both in Italy and in foreign countries. She was the friend of Michelangelo, who wrote several poems to her, and of many of the noted characters of her day. Consult Campori, ‘Vittoria Colonna’ (1878); Mrs. Roscoe, ‘Vittoria Colonna, Her Life and Poems’ (1868).

COLONNA, village in the papal states, which gave its name to one of the most powerful and celebrated aristocratic Roman families. During the Middle Ages the family played an important part in the affairs of Europe, became allied to the greatest houses of Italy, Spain and Germany, and furnished many celebrated warriors, popes and cardinals.

COLONNA, Cape. See Sunium.

COLONNA PALACE (It. *palazzo Colonna*), a handsome and interesting structure at the foot of the Quirinal, belonging to the family from whom it is named, but occupied of late years by the French embassy. It was commenced by Pope Martin V in the 15th century and was the residence of Julius II and of Cardinal Borromeo. It contains a picture gallery, open to the public every day except holidays, which in point of size and architecture ranks with the finest in Rome. The ceiling of the great hall, supported by handsome columns of *giallo antico,* is covered with frescoes illustrative of the history of the Colonnas, the central subject being the battle of Lepanto. The collection of paintings, formerly numbering 1,362 pieces, has been greatly reduced by division among branches of the family, but still embraces many magnificent works by Titian, Guido, Salvator Rosa, Guercino, Paul Veronese, Giulio Romano, Holbein and lesser artists. Almost equally celebrated as the picture gallery are the Colonna gardens, which extend behind the palace in terraces up the west slope of the Quirinal. They are planted with box, ilex, laurel, etc., and have long rows of straw houses in which the lemon is brought to rich perfection. There are some colossal ruins in the garden, supposed to belong to the temple of the sun erected by Aurelian, and to the baths of Constantine.

COLONNADE, a range of columns. If the columns are four in number it is tetrastyle; if six in number, hexastyle; when there are eight, octastyle; when 10, decastyle, and so on according to the Greek numerals. When a colonnade is in front of a building it is called a portico; when surrounding a building, a peristyle, and when double or more, polystyle. The colonnade is, moreover, designated according to the nature of the intercolumnations introduced as follows: Pycnostyle, when the space between the columns is one diameter and a half of the column; systyle, when it is of two diameters; eustyle, when of two diameters and a quarter; diastyle, when three, and aræostyle, when four or more. A colonnade differs from an arcade in this respect, that the columns of the former support straight architraves instead of arches.

COLONNE, kō'lŏn', **Jules Jude** («Edouard»), French conductor and violinist: b. Bordeaux, 1838; d. 1910. He studied at the Paris Conservatory, where he was a pupil of Sauzay, Elwart and Ambroise Thomas. He was awarded the prize in harmony and the first violin prize by the conservatory. He became first violinist at the opera-house, but soon resigned to undertake a series of Sunday concerts at the Odéon. He introduced the works of Tschaikowsky, Grieg, Wagner and Raff to the Parisians. He was an admirer of Berlioz, whose music he did much to make popular. He visited the United States in 1904.

COLONSAY, kŏl'ŏn-sā, and **ORONSAY,** ō-rŏn-sā, two islands off the west coast of Argyle, Scotland, united at low water, and at high water only about 100 yards apart; united length about 12 miles; breadth varying from one to three miles. Colonsay is much the larger and has a diversified surface with fine rock and other scenery and beautiful sandy beaches. On Oronsay are the imposing ruins of an extensive priory and near it a fine sculptured cross. Cattle and sheep are reared and fishing is carried on.. Visitors land at Scalasaig pier, on the island of Colonsay. The islands are named after Saint Columba and Saint Oran.

COLONUS, kō-lō'nŭs, an eminence near Athens, to which Œdipus retired during his banishment to Thebes, and from which Sophocles gave the title of "*Œdipus Coloneus*" to one of his finest tragedies. According to Pollux, there were two places at Athens known as Equestris and Agoræus Colonus.

COLONUS, in civil law, a freeman of inferior rank, corresponding with the Saxon *ceorl* and the German rural slaves. It has been held probable that many of the ceorls were descended from the *coloni* taken into Saxony by the Romans. The names of the *coloni* and their families were all recorded in the archives of the colony or district, from which fact they were also known as *adscriptitii.*

COLONY, a settlement formed in one country by the inhabitants of another. Colonies may either be formed in dependence on the mother country or in independence. In the latter case the name of colony is retained only in a historical sense. The motives which lead to the formation of colonies and the manner of their formation are various. The lust of territory; the requirements of commerce; the desire of increasing wealth, combined with the love of adventure; the necessity of relieving the pressure of redundant population; political dissensions; the convenience of removing to a distance persons likely to disturb the peace of the state, and especially the apparent ease with which a numerous criminal class may be got rid of by expatriations, are among the chief motives which have influenced colonization. Colonization is only a more formal development of the migratory tendency; and a colony may be considered as an organized and permanent migration.

Colonies among the Ancients.— Among ancient nations the principal promoters of colonization in the more formal sense were the Phœnicians, the Greeks and the Romans, and the greatest colonizers in modern times have been the English and the Spaniards, next to whom may be reckoned the Portuguese, the Dutch and the French. The Phœnician colonies, extending along the shores and throughout the islands of the Mediterranean, were mainly commercial. The most famous of them was Carthage, itself a great colonizing state. From the distance that divided the daughter communities from the mother states, and the slowness of communication, many of them must have been practically independent from a very early period; but this was not the case with the colonies of Carthage, which wielded powerful armies and maintained great fleets, both for commerce and for conquest. The Greek colonies were widely spread, being numerous in Asia Minor, the Balkan Peninsula and the islands and coasts of the Mediterranean, in South Italy and Sicily. They were commonly independent and frequently soon surpassed the mother states in power and importance. Constantinople, Naples, Palermo and Marseilles were all originally Greek colonies. Greek civilization was largely based upon and highly favorable to individual liberty, and the independence of spirit which it fostered made political dissension a frequent cause of colonization. A still more pressing one was the limited extent of the Greek territories and the inviting character of those by which they were surrounded. Rome was a state which left nothing to the individual. Its colonies were chiefly military and while the empire lasted were all in strict subordination. As the Roman power declined the remains of them amalgamated with the peoples among whom they were placed and contributed largely to the homogeneous growth of modern civilization.

Portugal.— Before America and the way by sea to the East Indies were discovered, the states of Europe in the Middle Ages, with the exception of the Genoese and the Venetians had no foreign colonies. The intercourse and wars of the Portuguese with the Moors, then more advanced in civilization than most of the European nations, served to incite their rivalry and stimulate them to maritime enterprise, and they became the pioneers of Europe in maritime discovery. One of the chief names in this connection is that of Henry the Navigator, son of John I of Portugal. The Portuguese in 1419 discovered Madeira; in 1431–60 the Azores; in 1487 Bartolomeo Diaz doubled the Cape of Good Hope; and on 20 May 1498, Vasco da Gama landed near Calicut on the Malabar coast, after a voyage round the south of Africa. The Moors had previously been in possession of the inland trade of India and it was not without a struggle that the Portuguese succeeded in establishing settlements on the coast of Malabar. The first Portuguese colonies were formed of garrisons placed along the coasts of the continents and islands they visited for the security of their commerce, as Mozambique, Sofala and Melinda on the east coast of Africa, Ormuz and Muscat, in the Persian Gulf; Goa, Diu and Damao, on the Malabar coast of India. Goa became the capital of their Indian dominions. Colonies were established in Ceylon in 1505; in the Moluccas in 1510; Java, Sumatra, Celebes and Borneo were also colonized, though the settlements there did not attain so great importance. The direction taken by the Portuguese navigators made them miss the discovery of America; but Brazil was discovered by Cabral in May 1500, a few months after Pinçon, and was colonized by the Portuguese about 1530. The splendid colonial empire of which the foundations were thus laid was not destined to last. As in the case of Spain, the energy of the Portuguese was trammeled by climatic and other conditions, and this, together with a despotic colonial policy, had weakened the power of Portugal before she fell in 1580 under the dominion of Spain. The colonial possessions of Portugal were afterward assailed by the Dutch as enemies of the Spaniards, and when she recovered her independence in 1640, many of them were irretrievably lost. Brazil declared its independence in 1822. The colonial possessions of Portugal are now mostly in Africa, the whole of her possessions in that continent embracing an area of 793,980 square miles. See PORTUGAL.

Spain.— Soon after the Portuguese the Spaniards commenced the work of colonization. On 12 Oct. 1492, Columbus discovered the island of San Salvador. Haiti, or San Domingo, named by Columbus Española, was discovered in the course of the same voyage, December

1492, and immediately colonized. Porto Rico and Jamaica were colonized in 1509; Cuba in 1511. On the mainland a Spanish settlement was effected in Colombia (New Granada) in 1511. Mexico was conquered 1519–21; Ecuador, Venezuela, New Granada, Peru and Chile were occupied and subdued between 1524 and 1541; and Spain was raised to the first rank among the colonizing powers of Europe. The Spaniards regarded their new possessions in various respects. Some, animated by a zeal for religion, considered the conversion of the natives as the great end which Heaven had assigned to them. Others were inspired by the love of glory or the passion for gain and scrupled at no means by which it was possible to gratify their wishes. Owing to the degraded character of many of the first colonists, who were often mere adventurers and released criminals, the first settlements suffered much from internal strife and confusion. After many dissensions the government of the colonies, in its fundamental traits, was settled in 1532, during the reign of the Emperor Charles V. A council of the Indies in Europe, viceroys, at first two, afterward four, together with eight independent captains-general in America, were the heads of the administration. Cities were founded, at first along the coasts, for the sake of commerce and as military posts; afterward also in the interior, especially in the vicinity of the mines; as Vera Cruz, Cumana, Porto Bello, Carthagena, Valencia, Caracas; Acapulco and Panamá on the coast of the Pacific; Lima, Concepcion and Buenos Aires. The whole ecclesiastical discipline of the mother country was transferred to the colonies, except that in them the Church was much more independent of the king. The intercourse with Spain was confined at first to the single port of Seville, afterward to that of Cadiz, from which two squadrons started annually. Thus, although commerce was not expressly granted by law to a society, it remained nevertheless entirely in the hands of a few individuals. Spain took possession of the Philippine Islands in 1565 and a regular intercourse was maintained from 1572 by the South Sea gàlleons between Acapulco and Manila; but owing to the great restrictions on commerce those islands, notwithstanding their advantageous situation, were an expense to the Crown. Spain proved to be the foremost of the colonizing powers of Europe in respect to the formation of new states; the most unfortunate of all in regard to the retention of her possessions. The causes of the loss of her colonies differed from those which prevailed in the case of the Portuguese. European wars and the decline of her home power were the most important, but they did not so often lead to the colonies falling under other powers, as in the case of Portugal. They more frequently became the occasion of revolt and the opportunity for declarations of independence on the part of the colonies themselves. Thus were formed the republics of Mexico, of Central America, of Venezuela, New Granada, or Colombia, Ecuador, Peru, Bolivia, Chile, etc.; but as the weak government of the mother country served to promote this early defection, few of the states formed in this unfortunate school have yet attained the repose of settled government. An insurrection began in Cuba in 1895, and after Spain had in vain endeavored to suppress it the United States interfered. War followed, with the result that after a brief struggle not only Cuba, but also Porto Rico and the Philippine Islands were lost to Spain. See SPAIN.

The Netherlands.— The Dutch, during the struggle for independence, first became the formidable rivals of the Portuguese, then subject to the Spanish yoke. They had already for some time carried on the trade in East India merchandise between Lisbon and the rest of Europe, but their intercourse with Lisbon was prohibited by Philip II in 1584. The prohibition was revived in 1594 with the utmost severity, and a number of Dutch vessels in the harbor were seized. Excluded from the European trade in the productions of India, they resolved to import directly from India the articles which were refused to them in Europe. Companies were formed, which were united into one by a charter granted 20 March 1602 to the Dutch East India Company, established in 1595. This charter, which was renewed afterward at different times, conferred not only the monopoly of the East India trade, but also sovereign powers over the conquests which the company should make, and the colonies which it should establish in India. An entirely new colonial policy was thus introduced, which, instead of political or ecclesiastical aggrandizement, contemplated mercantile advantage as its main object. The Dutch colonies in the East Indies were thus commercial colonies; and the islands of the Malay Archipelago, being more easily defended than the continent of India, became the principal seat of the Dutch power. This was undoubtedly the chief cause of their colonies being so long in a flourishing condition, as they required only the dominion of the sea to maintain them. In 1619 the newly built Batavia was made the capital of the Dutch East Indies. About the middle of the 17th century the power of the Dutch reached its highest point. They effected the establishment of a colony at the Cape of Good Hope in 1652, which afforded an excellent bulwark for their East India possessions, and took Ceylon from the Portuguese, after a long and sanguinary struggle in 1658. All the Dutch colonies in the East Indies were under the governor-general of Batavia. In 1621 the Dutch also established a West India Company, which at first made extensive conquests in Brazil, but soon lost them entirely (1624–62). Their settlements on some of the smaller West India Islands, as San Eustatia, Curaçoa, Saba and San Martin (1632–49), were more permanent. On the continent Surinam, Paramaribo, Essequibo and Berbice were in the hands of the Dutch in 1667. In North America the Netherlands held the valley of the Hudson and pushed south at the expense of the Swedes, winning the present States of New Jersey and Delaware, only to lose them to England. The decline of the Dutch colonial power, partly caused by European wars and partly by the successful rivalry of the English, continued from the end of the 17th century till the French Revolution. On the recovery of its independence, the commerce and the colonial importance of Holland somewhat revived and though many of her colonies were lost the value of the remainder was enhanced by improved administration. The Dutch still possess numerous colonial possessions in the East Indies, including

Java, Sumatra, parts of Borneo, the Moluccas and part of New Guinea; several small islands in the West Indies and Surinam. See NETHERLANDS.

Great Britain.— No colonizing power has had a career of such uniform prosperity as Great Britain. The freedom of her institutions and the practical enterprise and self-reliance of her people peculiarly fitted her for the work of colonization and it has steadily advanced with her equally in peace and in war. Her insular situation freeing her from the ambition of direct territorial aggrandizement and giving her the command of the seas enabled her in every war to strip her opponents of colonial possessions which were not unfrequently retained as the price of peace. The only break in a career of prosperity which has resulted in the formation of an empire greater in extent of territory and of population than any other known to history was the revolt of her American colonies, which resulted in the formation of a state destined ultimately to rival Great Britain herself in political and commercial importance and in the freedom of its institutions. This state, too, by the successful result of the war of 1898 with Spain, itself entered on a policy of colonial expansion.

The English made their appearance as a colonial power nearly at the same time with the Dutch, but at first with far inferior success. After many fruitless attempts to find a northeast or northwest passage to the East Indies, English vessels found their way round the Cape of Good Hope to the East Indies in 1591. In 1600 Elizabeth granted a charter to the East India Company. Its commerce with India, however, was not at first important. It established only single factories on the continent, and at the beginning of the 18th century the possessions of the English in the East were limited almost exclusively to Madras, Calcutta and Bencoolen. The ruin of the Mogul empire in India, which commenced in internal disturbances after the death of Aurungzebe (1707), and was completed by the incursions of Nadir Shah (1739), afforded the opportunity for the growth of British power, as the British and French were compelled to interfere in the contentions of the native princes and governors. The French, under Labourdonnais and Dupleix, appeared at first likely to maintain the superiority; but the British succeeded in acquiring the ascendency in the Carnatic; and in the middle of the 18th century they greatly extended their dominions under Clive. By the destruction of Pondicherry they secured their superiority on the coast of Coromandel; and the victory of Clive at Plassey, 23 June 1757, laid the foundation of their exclusive sovereignty in India. By the Treaty of Allahabad, 12 Aug. 1765, Bengal was surrendered to the British by the titular Great Mogul; and the fall of the empire of Mysore, the dominions of Hyder Ali and Tippoo Sahib, may be considered as completely establishing the British supremacy in India. The Mahrattas, with whom the British waged war at intervals from 1775 to 1818, and the Sikhs, subdued in 1849, were the last formidable enemies of the company. With the exception of a few dependent states the British territory now embraced nearly the whole of India, and this vast territory was still under the government of a chartered mercantile company, exercising many of the most important functions of an independent sovereignty. On the suppression of the Indian mutiny (1857–58) this state of things was deemed too hazardous to last and the government of India was transferred to the Crown by act of Parliament in 1858. Ceylon was first occupied in 1795–96.

The discoveries of the Cabots, following soon after the voyages of Columbus, gave the English Crown a claim to North America, which in the reign of Elizabeth led to colonization on a large scale. In 1606 James I divided the territory claimed by England into two parts — South Virginia, extending from Cape Fear to the Potomac; and North Virginia, from the mouth of the Hudson to Newfoundland. Two companies were formed for the colonization of America — the London Company, to which was granted South Virginia; and the Plymouth Company, to which was granted North Virginia. The region between the Potomac and the Hudson was neutral ground. The London Company in 1607 founded the commonwealth of Virginia by building Jamestown on the James River, so called in honor of the king. A House of Burgesses for the new colony met for the first time on 19 June 1619, and thus was constituted the beginning of representative government in the British colonies of America. In 1614 Capt. John Smith, having examined the coast from the Penobscot to Cape Cod, named the country here New England. The next permanent settlement on the North American coast was effected in this district by the body of Puritans, known as the Pilgrim Fathers, who sailed from England 6 Sept. 1620, in the *Mayflower*, and arrived 9 November in Massachusetts Bay. The government of this colony was that of a religious oligarchy. Another colony was established in New Hampshire in 1623, and in the same year Maine, which had previously been colonized by the French, received its first permanent English settlement. New Jersey was colonized in 1634. Connecticut was colonized in 1635 by emigrants from Massachusetts. Rhode Island was settled in 1636. Samuel Champlain, the French navigator, was the first European who entered the region now forming the State of New York (1609). In the same year Henry Hudson, an Englishman in the service of the Dutch East India Company, discovered the river to which his name has been given, where Dutch settlements were effected and gradually spread. The English, who claimed this territory as included in Cabot's discoveries, finally seized the Dutch colony of New Amsterdam by force in 1664, giving it the name of New York in honor of James, Duke of York (James II), to whom Charles II had made a grant of the province. In 1670 the charter of the Hudson's Bay Company was granted, by which ownership of all the regions whose waters discharge into Hudson Bay — a territory as large as the whole of Europe — was conferred on the company, the rights to which were only finally extinguished in 1869. In 1681 the territory west of the Delaware was granted to William Penn, who colonized it with Quakers, and founded Pennsylvania in 1682. The first settlement in Maryland was made in 1631 by a party from Virginia. In 1633 a colony of Roman Catholics arrived here from Great Britain. The country south of Virginia was permanently settled in 1670 by a party of

English colonists who landed at Port Royal and afterward removed to Charleston. The colony was called Carolina. Georgia, originally a part of Carolina, was granted by George II, after whom it was named, to a colony from England in 1732.

Colonies were early established in the West India Islands, including Barbados, half of Saint Christopher's (1625) and soon after many smaller islands. Yet the West India possessions did not become important as plantations until the sugarcane was introduced into Barbados in 1641 and into Jamaica in 1660. This island had been taken from the Spaniards in 1655. The cultivation of coffee was introduced into the West India Islands in 1732. Newfoundland was taken possession of by the English in 1583, and colonized in 1621 and 1633. Canada was surrendered by France to Great Britain at the Peace of Paris in 1763 (see section on French colonies below). In 1764 began the dispute between Great Britain and its North American colonies, on the question whether the former had the right to impose taxes on the colonies when they were not represented in the British Parliament; and on 19 April 1775 commenced the war which terminated with the acknowledgment of the independence of the 13 provinces. Though the United States thus entered on their independent career, Canada still remains as a great and flourishing self-governing dominion.

Australia was discovered in the beginning of the 17th century. The first Australasian settlements of Great Britain were penal colonies. New South Wales, discovered in 1770, was established as a penal colony in 1788; Tasmania (Van Diemen's Land), discovered by Tasman in 1642, followed in 1803. West Australia, for some time a penal settlement, was founded as a free colony in 1829; Victoria (Port Phillip) was colonized in 1835, and made an independent colony in 1851; South Australia was settled in 1836; Queensland became a separate colony in 1859; New Zealand, discovered by Tasman in 1642, began to be used in connection with the whale fishery about 1790, was settled in 1839 and made a colony in 1840. In 1851 gold was discovered to be plentiful in Victoria. This gave a great impetus to the prosperity of the Australian colonies, and the influx of population it caused has largely contributed to promote their general development. A federal union of the British colonies in Australia was proclaimed 1 Jan. 1901, with the title of the Commonwealth of Australia. The Fiji Islands became a colony in 1874, and other islands in the Pacific have been acquired since, as well as part of New Guinea and part of Borneo.

The acquisition of the South African colonies dates from the Napoleonic period, the Cape Colony and Mauritius being both secured to Great Britain in 1814. Natal was proclaimed a British colony in 1843. The Guinea Coast settlements date from the 17th century. Extensive spheres of influence have been recently acquired, being partly developed by chartered companies.

In Europe Great Britain has only two possessions of the nature of colonies, acquired for military reasons: Gibraltar in 1704; Malta and Gozo, 1800.

It is estimated that the existing British colonies and dependencies embrace fully one-fifth of the land surface of the globe, and a rather larger proportion of its population. The whole of the British colonial possessions have been grouped in about 40 administrative divisions and they are situated in every quarter of the globe. See Great Britain.

According to their governmental relations with the Crown the colonies are arranged under three heads: (1) Crown colonies, in which the Crown has the entire control of legislation, while the administration is carried on by public officers under the control of the home government; (2) colonies possessing representative institutions, but not responsible government, in which the Crown has no more than a veto on legislation, but the home government retains the control of public officers; (3) colonies possessing representative institutions and responsible government, in which the Crown has only a veto on legislation, and the home government has no control over any officer except the governor. All colonies are, however, disabled from such acts of independent sovereignty as the initiative in war, alliances and diplomacy generally.

France.— France was somewhat late of entering fully upon a colonial career, being retarded by internal dissensions and religious wars. Between 1627 and 1636 Pierre Belain d'Esnambuc colonized Saint Christopher's, Guadeloupe and Martinique. Champlain was the pioneer of the French in the exploration of the North American continent, where they soon had considerable possessions, including Canada — in which they had settlements as early as 1604–05, and where Champlain founded Quebec in 1608 — and Louisiana, colonized in 1699. Commercial companies were then deemed essential in colonizing, and a West India Company and an East India Company were established by Colbert in 1664. He purchased on several West India Islands, as Martinique, Guadeloupe, Saint Lucia, Grenada and others, settlements already formed by private persons, and sent out colonists in 1664 to Cayenne. But the settlements in part of San Domingo, by the buccaneers, became of more importance than those effected by the government. The West India Company survived only 10 years. The East India Company, after fruitless attempts to form a colony in Madagascar, founded Pondicherry on the Coromandel coast in 1683. This became the capital of extensive French possessions in the East Indies. The French also acquired Bourbon (Réunion) in 1649 and the Isle de France (Mauritius) in 1715. At the beginning of the 18th century France had attained an important position as a colonial power. In North America her settlements extended from Canada to California, particularly along the Great Lakes and the Mississippi River, embracing many districts which have since become of the highest importance. Nova Scotia (Acadie) and Newfoundland (Terre Neuve), which had been disputed with Great Britain, were then in her possession. Her West Indian islands were more flourishing than those of England, and she still had a prosperous career before her in India. The superiority of the fleet of England gave that power a great advantage in colonial contests, and many of the French colonies subsequently fell under the power of Great Britain. The struggle for the supremacy in India, though France was finally unsuccessful, was long and gallantly maintained, and more than once seemed to promise a different issue. The North American colonies were partly lost by conquest and partly suffered to fall into decay. Of the West India possessions several were taken by Great Britain and finally ceded to her. Canada was finally ceded to England in 1763; Louisiana, after being surrendered to Spain, to prevent it from falling into the hands of the English, was sold by Napoleon to the United States in 1803. At the general pacification of 1815 France recovered some remains of her colonial possessions, and since then she has acquired extensive regions beyond sea, some of them highly valuable. She occupied in 1830 and began in 1833 to colonize Algeria, a country whose irregular and lawless government had exposed her as well as other European states to frequent annoyance. Tunis, Senegambia, great tracts of the Sahara, Sudan and Kongo regions, the islands of Madagascar and Réunion are all comprised in France's African possessions, while in Asia she possesses a large portion of the Indo-Chinese Peninsula, and in America French Guiana. Some of the French colonies are represented in the National Assembly by members chosen for the purpose. See FRANCE — COLONIES.

Denmark; United States; Sweden.— Denmark established an East India Company in 1618 with a view to enter on the colonial trade; and other companies were afterward formed. In the same year, with the formation of the first company, the colony of Tranquebar was founded on the Coromandel coast. Its success was fluctuating, like that of the companies formed to manage it, and at last, in 1845, it was sold to the East India Company. Saint Thomas in the West Indies was settled by the Danes in 1672; Saint John and some of the smaller islands in the same group (the Virgin Islands) were also occupied by them. The island of Santa Cruz was purchased from France in 1733. By a treaty signed 4 Aug. 1916, the West India islands belonging to Denmark passed into possession of the United States at the purchase price of $25,000,000. Formal transfer took place on 31 March 1917, and the islands are now called the Virgin Islands of the United States. Sweden established an East India Company in 1741. She acquired the island of Saint Bartholomew from France in 1785, but restored it in 1878, and has now no colonies.

Germany.— A German historian of the colonial movement dates his story from the end of the Crusades, while another, not to be outdone in the national virtue of thoroughness, seek its origins in pre-Christian annals. For practical purposes, the German colonial movement, as we know it to-day, is barely over 30 years old. There were genuine if tentative efforts at colonization as early as the 17th century, when the Great Elector of Brandenburg established settlements on the west coast of Africa. Earlier still the Hanseatic Towns would have traded with foreign territories had they not been frowned upon at home. Prussia's and Germany's dreams of world-conquest and colonization were dispelled when Frederick William I of Prussia (1713–40), more concerned to assure his sovereignty at home, abandoned the Great Elector's settlements. The new policy was shared by Frederick the Great (1740–86), who considered all distant possessions «a burden to the state» and «a village on the frontier worth a principality 250 miles away.» Nearly a century and a half was to pass before the colonial question again seriously entered German politics. Germans are in the habit of dating the modern movement from 1874, when Great Britain annexed the Fiji Islands, in which German trade had long flourished. This incident, however, did not create a colonial spirit, but about this time the explorer, Gustav Nachtigal (1834–85), visited various parts of Africa, carrying presents to native chiefs from the German Emperor, though he made no attempt to acquire territory. At this time while great portions of Africa were being brought into the British sphere of influence there was no appreciation of colonial aims in Germany, and all the nation's effort was directed toward developing at home the advantages which had followed from the successful war with France. It was only in 1883 that the first colonial society, the Kolonial Verein, came upon the scene. Up to then there was no systematic colonial enterprise and no organized colonial policy in Germany. It was the Bremen trader, Herr Lüderitz, who gave to Germany her earliest colonial possession. In 1882, by treaties with native chiefs, he acquired land in the Bay of Angra Pequena, on the southwest coast of Africa, and he pressed the home government to support his claim. For a time nothing was done, until the claims of Herr Lüderitz were disputed by agents of the British Crown. Lüderitz's appeal for protection roused Bismarck's interest and he formally annexed Lüderitzland. This gave Germany the coastland extending from the Orange River to Cape Frio, exclusive of Walfish Bay. What happened in Southwest Africa happened, too, in the Northwest. German claims to territory on the Cameroon River led likewise to disputes, and here also Bismarck cut the Gordian knot instead of waiting for it to be unravelled. In the Pacific German settlements had been established since 1880 for trading purposes on the north coast of New Guinea, and over these, as well as the New Britain Islands, the German flag was hoisted in the winter of 1884. These two new acquisitions were promptly renamed, the one being called Kaiser Wilhelm's Land and the other Bismarck Archipelago. The following year saw fresh annexations in East Africa, to develop which a wealthy company was formed, and in the Pacific the Marshall Islands and part of the Solomon group were also acquired. The treaties under which Germany declared a protectorate over the East African regions were concluded by Dr. Karl Peters, an ardent colonial pioneer, who entirely subordinated means to ends. Each of these annexations served as a starting point for large extensions of territory, so that after two years of diligent search and salvage amongst the still unregarded regions of the African continent and the Pacific, Germany found itself in possession of a colonial empire having an area of 377,000 square miles and an estimated population of 1,750,000. Bismarck never had great faith in colonies, his policy being consolidation at home, and he only gave his consent to the expansionist policy when he knew the country to be behind him. Caprivi, Bismarck's successor, was hostile to the colonial movement and it was not until he fell that the traditions of colonial expansion were revived under Prince Hohenlohe in the nineties. Thus the Caroline Islands were annexed in 1899, also the Pelew and Marianne groups. In the same year the Samoan Islands were brought under the German flag; already in 1897 Kiau Chau had been wrested from China. The total area of Germany's colonial possessions in 1914 was 1,027,820 square miles, with a white population of 24,389 and a native population of 12,041,603. In the course of the European War one after another of her colonies became lost to Germany. Togo was taken by combined British and French forces on 7 Aug. 1914. Cameroon was conquered by French and English troops on 18 Feb. 1916. South West Africa fell to the South African forces of General Botha on 9 July 1915 and is administered by the Government of the Union of South Africa. East Africa was occupied during the war by British, Belgian and Portuguese forces and was finally conquered in 1917. Kiau Chau fell to combined Japanese and British forces on 7 Nov. 1914. In the north Pacific the German possessions were captured by the Japanese shortly after the outbreak of the war in 1914 and were handed over to the Australian forces. The islands south of the equator are administered by Australia, those north of the equator by Japan, and Samoa by New Zealand. German colonial administration has not been happy in its methods nor yet in its officials. The principle laid down by Bismarck was soon departed from: the trader, having obtained protection, went back to his plantation, his compound, his stores; he certainly was not urged to play any part in the government of his colony; gradually the whole system of Prussian bureaucracy was introduced in each of the colonies, large and small. The secret of the administrative order that reigns at home is «system,» and it was taken for granted that if sufficient «system» were introduced into the government of the colonies the same results would follow. Furthermore, far too little regard was paid to native customs and traditions of life. Instead of studying native law systematically and regulating administration in each colony according to its peculiar traditions, all colonies alike were governed according to set Prussian legal maxims interpreted in a bureaucratic spirit by jurists with little experience of human nature, and none at all of native usages. The choice of officials was also unfortunate in a majority of cases; the colonies being regarded as relief institutions for the benefit of men who had failed at home. It was declared from the throne in 1888 that it must be a solemn duty of the Empire to «win the Dark Continent for Christian civilization.» Not much Christian civilization, or civilization of any kind, was carried to the colonies. Stories of slavery, violence, cruelty, illegality and lust, committed both by officials and planters, were reported only too frequently by missionaries and clean-handed men in the colonial service, who could not see these things and be silent. The use of force as the only method of civilizing the native was constantly advocated with a daring frankness. In South West Africa the Hereros were decimated by the armed forces of Germany. General von Trotha wrote in his proclamation of 2 Oct. 1904: «The Herero people must leave the land. If it refuses I shall compel it with the gun. Within the German frontier, every Herero, with or without weapon, with or without cattle, will be shot. I shall take charge of no more women and children, but shall drive them back to their people or let them be shot at.» The leader of the German People's party in the Reichstag said before that body on 24 March 1906 that «The legal position of the blacks is miserable in the extreme. The honor of the German name suffers under this absolutely arbitrary system. We have lost the sympathy of the black race.» The Great War has brought about the loss to Germany of its colonial possessions acquired within the memory of the majority of men living. On the colonial record of Germany as on many other records of that nation must be written in large letters the word failure.

Italy.— Italy has also shown the same ambition, and has established the colony of Erethrea on the African side of the Red Sea, between it and Abyssinia, in Somaliland; and as a result of the war with Turkey in 1912 acquired Tripoli.

The colonial policy of paternalistic countries as Spain, Portugal and France naturally differed from that of commercial and industrial nations like England and Holland. In the former the expense and risk of colonizing was borne by the government, who retained direct control over the colonies and their productions; but in the latter the work, being too much for individual enterprise, was entrusted to companies, whose charters conferred on them not only exclusive privileges in regard to trading, but also extensive powers of conquest and administration. In respect to trade a very exclusive and jealous policy long prevailed, but since the adoption of a free-trade policy in Great Britain the whole trade of her colonies has been thrown open without reserve, as far as the privileges of the mother country are concerned, to the competition of foreign nations. Other countries, while not following her commercial policy entirely, have relaxed more or less the stringency of the regulations affecting their colonial trade. See AMERICA, COLONIZATION AND DISCOVERY; CANADA — ERA OF EARLY DISCOVERIES; COLONIES AND COLONIZATION; IMPERIALISM.

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COLOPHON (Gr. *Kolophon*, «summit»), an ancient Ionian (Greek) city of Asia Minor situated at a short distance from the coast and about 15 miles north of Ephesus. Its inhabitants were removed by Lysimachus after the death of Alexander the Great. Colophon was one of the places that claimed to be the birthplace of Homer. It was the native city of Mimnermus and other poets. Its site was discovered in 1887 by the German explorers, Schuchhardt and Wolters. Proverbially Colophon came to mean «a finishing stroke» because of the many instances in which the city's cavalry carried the day. The word took this proverbial meaning in Latin and was used by early printers as the imprint at the close of a volume; commonly used before the introduction of the title page. See next article.

COLOPHON, kŏl'ō-fŏn, an inscription at the «Finis» of a book, giving the printer's name and date and place of printing; in the early days of printing nearly all books had colophons. Usually they are ludicrous in the extravagant claims the printers made for the unapproachable excellence of their handiwork; but some are modest and dignified, while a few are pathetic, showing the hard struggle made by masters of the noble craft for a bare subsistence.

COLOPHONIUM. See Rosin.

COLOPHONY, a name formerly used for common rosin (q.v.), but now found only in books.

COLOQUINTIDA. See Colocynth.

COLOR. Color may be studied objectively as a wave phenomenon (see Light), in its psycho-physiological aspect as a retinal stimulus (see Vision), or, subjectively, as an appearance or ocular sensation; this last is the viewpoint of the present article.

Isaac Newton (‹Philosophical Transactions,› No. 80, 1672) was the first to show that white light (sunlight or daylight) may be resolved into elemental colored lights or rays which cannot be further decomposed, but which on being superposed form white light. The question whether sunlight contains these colors in the form of a mixture analogous to a mixture of, say, nitrogen and oxygen gases in the air or is a compound, as water is of hydrogen and oxygen, belongs to physics. Newton adopted the first point of view; at the present time the second is gaining favor. The elemental lights, distinguished visually by their colors, are seen in the rainbow, the sparkle of a diamond, in soapbubbles, in a film of oil on water, by looking at one's eyelashes through nearly closed lids, and in many other phenomena discussed in physical optics under the names dispersion, interference, absorption, polarization, fluorescence, diffraction, refraction. They are called spectrum colors — popularly, «colors of the rainbow» — and are monochromatic, i.e., they consist of single colors (colored lights or rays) that are elemental in the sense in which this term is used in chemistry. We are accustomed to think of the spectrum as having only six colors: red (R), orange (O), yellow (Y), green (G), blue (B), violet (V); Newton named a seventh, indigo, situated between B and V. But the number of colors is enormously great; Aubert (‹Physiologie der Netzhaut,› 1865) estimated the solar spectrum to contain about a thousand distinguishable hues, of which, according to Rood (‹Modern Chromatics,› 1881) 2,000,000 tints and shades can be distinguished. However, these differences cannot be seen *in situ* in the spectrum because the color areas are too small. Luckiesh (‹Color and its Applications,› 1915) states that 55 distinctly different hues have been seen in a single spectrum.

Color Sensation.— Color is a sensation produced through the excitation of the retina by rays of light. Thus black (Bk) and white (W) are color sensations, although Bk is due to no, and W to complete, stimulus. The infra-red rays — below the red end of the spectrum — and the ultra-violet — beyond the violet end — are invisible. Heat is the principal effect of the infra-red and chemical action, as on a photographic plate, that of the ultra-violet rays. To the physicist all of these visible and invisible emanations are regarded as electromagnetic waves differing essentially in wave length alone. All have chemical and thermal effects but only some give to the eye the sensation called color. Although none of the spectral colors can be resolved into others, some can be imitated to the eye by combinations of others. Combinations of R and V produce purples which are not in the spectrum at all; such compounds are nevertheless resolvable into their constituents by spectroscopy. Two colors not distinguishable to the eye may have quite different compositions. For example, a solution of potassium dichromate and one of potassium dichromate and neodymium ammonium nitrate in suitable proportions impress the eye as having precisely the same yellow color; but whereas a mercury arc light will look yellow on being viewed through the first solution, it will look brilliant green through the second. No pigment is monochromatic, yet it is possible in many cases to match spectral colors by means of pigments. Color to the eye is therefore not color in the sense of being one definite constituent of white light. Since color is entirely subjective it must be influenced by personal idiosyncracy; indeed some people are color-blind and cannot, for instance, tell red from green. (See Vision). On the other hand, santonin poisoning produces, in otherwise normal people, a pathological condition called chromatopsia, in which all «colors» are yellow. In short, the eye is unable to analyze color in the way that the ear can detect the component tones in a chord.

Color Constants.— Artists speak of cold, warm, advancing, and retiring colors. By warm are meant red, orange and yellow, and any tendency toward them; it has no connection with heat, but is suggested rather by the luminous glow of sunlight. An advancing color seems to be nearer the eye than one which is called retiring; the effect is evident in only a few simple cases: orange seems to be nearer than green when both occur in juxtaposition on the same surface, green nearer than violet, yellow than red, red than blue, black than yellow. The reader may easily experiment with the excellent colored coated-papers suitable for the purpose, various sizes of which can be obtained in black, white and in 18 spectral hues, with two tints and two shades of each. Color has three characteristics: hue, purity or saturation, and luminosity or brightness. Hue is color *per se,* such as blue, pink, black, etc.; purity depends on freedom from admixture with white; only monochromatic colors are saturated. Luminosity depends on the amount of light given by the color. A tint is a departure from a normal or dominant spectral hue in regard to purity, i.e., tints are whiter than the arbitrarily selected normal. A shade is darker than the normal and may be produced by decreased illumination or by the addition of black. It must be clearly understood that luminosity does not affect purity: a tint cannot be made to look as saturated as its normal merely by decreasing the illumination, thus pink never looks red in a subdued light. A compound color can be defined accurately only in terms of the characteristics of its monochromatic components. But every color, simple or compound, except purple, can be matched so far as the eye is concerned by a tint or a shade of some simple spectrum hue.

Color constants are measured with a spectrophotometer, which is a combination of a spectroscope with a photometer. The spectroscope produces an ordinary white-light spectrum, one narrow transverse band of which can be passed through the photometer; at the same time white light of any intensity is superposed on this colored band. The colored light which is to be examined — in the case of a colored surface the light reflected by it — also passes through the photometer and forms a field next to the combination of spectral ray and white light. By selecting the proper hued spectrum ray, controlling the added white and adjusting the resultant until it matches in color and brightness the light to be examined, we can determine hue, saturation and luminosity. Descriptions of instruments and full references are given by Luckiesh. The following are typical results; they will vary with the reflection coefficient of the surface, i.e., with the relative amount of white light it reflects. The wave lengths of the hues are expressed in microns: 1 micron = 0.001 millimeter. The columns headed «per cent white» give the amount of white light which had to be added to the normal spectrum hue to reduce its saturation.

(ABNEY, 'RESEARCHES IN COLOR VISION,' 1913)

Pigment	Hue	Per cent white
Vermilion	0.610 μ	2.5
Emerald green	.522	59
Fr. ultramarine blue	.472	61
Brown paper	.594	50
Orange	.591	4
Chrome yellow	.583	26
Blue-green	.500	42
Eosin dye	.640	72
Cobalt blue	.482	55

(NUTTING, 'BULLETIN BUREAU STANDARDS,' 1913, 9, NO. 187)

Materials	Hue	Per cent white
Sulphur	0.571 μ	48
Cork	.586	56
Tobacco leaf	.597	65
Chocolate	.595	70
Butter, dark	.580	28
Paris green	.511	56
Manila paper	.582	65
Copper	.597	70
Brass, light	.575	60
Gold, medium	.591	64

(L. A. JONES, 'TRANS. I. E. S.,' 1914, 9, P. 687)

Source	Hue	Per cent white
Sunlight	......	100
Average clear sky	0.472 μ	60
Tungsten lamp	.588	35
Carbon lamp	.591	25
Nitrogen tungsten lamp	.584	45
Mercury vapor arc	.490	70
Carbon arc	.584	62
Acetylene flame	.585	36

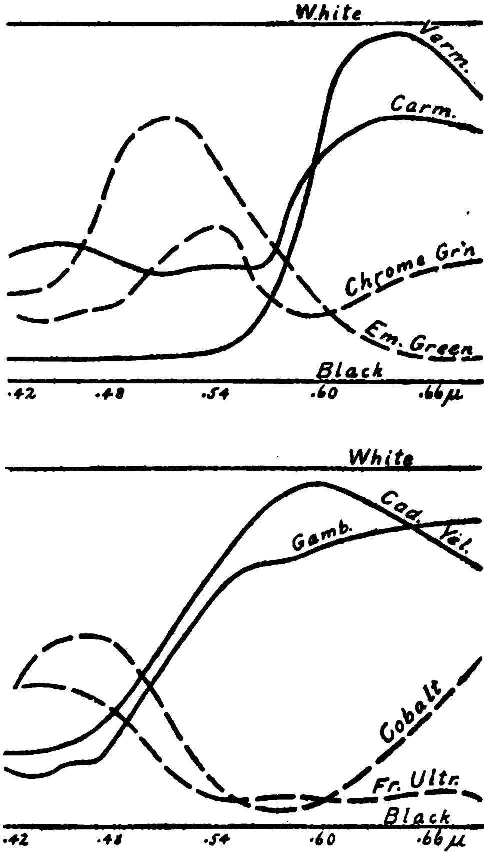
These results are color matches rather than color analyses. They show, for example, that highly colored butter, manila paper, chrome yellow paint, the nitrogen tungsten lamp and the carbon arc light are all of about the same hue and differ only in purity and brightness, i.e., they are tints and shades of one another. As the three observers did not use identical light sources in their experiments, the purities in the tables are relative. The following values from Hurst ('Color,' p. 17) give a rough idea of the luminosity of, or the amount of white light reflected by, various pigments in terms of white paper as a standard.

White paper	100	Emerald green	51
Vermilion	20	Ultramarine	50
Orange red	40	Umber	22
Yellow ochre	56	Chrome yellow	61

On comparison with the first table it is seen that although vermilion is very pure, very nearly saturated, it reflects comparatively little light. The two sets of numbers are quite independent and express two different characteristics of color.

Color Analysis.— Analysis of a compound color is used here to mean separation into spectral components. For example, French ultramarine is a fair match to what is regarded as the typical spectral blue of wave length 0.472 microns; both give rise to the same sensation and are therefore physiologically identical, yet the spectrum ray is monochromatic and the pigment decidedly complex. If the light reflected from a colored surface is analysed spectroscopically it is found to contain all the spectrum hues in varying intensity.

The following diagrams, adopted from Luckiesh, give spectroscopic analyses of certain pigments. Vertical distances indicate the relative intensities with which the wave lengths along the base are reflected and correspond to luminosities in the absorption spectra. The area under a curve measures the luminosity of the pigment itself. White is a horizontal line at greatest height because it reflects all colors equally; black reflects none and therefore is chosen as the base. Gray would be some intermediate horizontal line. No analyses of mixed pigments are as yet available and it is difficult to predict the exact form of the resultant curve. However, we can arrive at approximate results. According to the diagrams a surface painted with cadmium yellow will look intensely yellow when illuminated with monochromatic yellow light, orange in orange light, red in red and green in green, but in blue or violet light it will be grayish. French ultramarine will be violet, blue, green in corresponding illuminations but grayish in yellow, orange, red. The only color which cadmium yellow and ultramarine both reflect is green, the others being largely but not entirely absorbed. The green produced by a mixture of these two pigments although far from being monochromatic is much more nearly so than the pigments themselves. But its luminosity has been considerably reduced by absorption; in fact a mixture of monochromatic blue and yellow pigments would be black because no light would be reflected at all. Mixed pigments tend toward blackness; painters therefore select pigments which possess inherent color and do not mix unless a subdued, murky or grayed effect is desired. Unfortunately there is as yet no accepted theory of inherent color; it is not known why chromium oxide is green, hydrated ferric oxide red or ferric hydroxide yellow. Consult 'Berichte d. deut. chem. Gesell' (1906, 39 p. 1959), and *Journal of the Chemical Society* (1906, 89 p. 1787); see also DYEING.



Spectrum Analyses of Pigments

When a surface is illuminated with colored light, as in stage lighting effects, the hue actually seen depends on the local color of the surface, on the light reflected before absorption takes place and on the remainder reflected after absorption. Ogden Rood found that non-monochromatic yellow light looked bright green on Prussian blue and white on ultramarine. The Prussian blue had evidently absorbed all but the green component that must evidently have been in the yellow, while, as will be seen later, the ultramarine had absorbed all but the monochromatic yellow component. In the first case green was the dominant hue reflected, in the second case it was yellow plus blue. This shows that the parts played by absorption and reflection are difficult to predict.

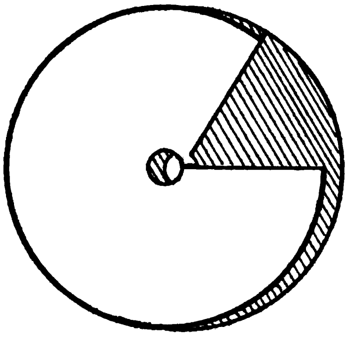
Additive Combinations.— Combinations of colors are always combinations of spectral lights whether they are made additively by direct superposition of the components or subtractively by absorption as in a mixture of powders or solutions. When red and green spectrum rays are thrown upon a white surface both colors are simultaneously reflected to the eye and give the sensation of yellow; on the other hand a mixture of red and green paints will in certain proportions give a gray which may be reddish or greenish, but never yellow, because together they subtract from the white light (daylight, etc.) which illuminates them all colors except those whose combination impresses the eye as gray. Such apparently contradictory results have been the source of many absurd controversial "theories of color." There are facts about color and theories of the psychophysiological processes of color perception but no theories of color other than chemical theories of molecular grouping.

Colors may be added in several interesting ways. Fine lines alternately red and green or blue and yellow, etc., ruled close together on white paper and examined from a distance through the large end of opera glasses so that the individual lines are not distinguishable give the eye two simultaneous sensations whose effect is quite different from that of the corresponding pigment mixtures. This method was used by Miles as early as 1839. It may be performed also by painting one end of a pack of papers with one color and the opposite end with another and then reversing alternate papers; or otherwise by stippling points of different hues on a white surface, or by using the color-wheel described later. Artists often employ the stippling process with beautiful results because the surface so treated fluctuates in hue according as one or another of the components momentarily predominates by reason of the varying degrees of fatigue of the color nerves in the retina. It has been found experimentally that all hues can be produced by suitable combinations of three physiological primaries: monochromatic red, green, blue (or violet). Thus red plus green in different proportions produce additively all the hues from red through orange, orange — yellow, — yellow, yellow — green, green; red plus blue give violet, red — violet, blue — violet and the purples; blue plus green produce blue — green and green — blue; red plus green plus blue in certain proportions give white, in others they reproduce colors obtained from pairs of the primaries. This is the first great group of phenomena that can be accounted for only by studying the subjective effect of color. It is strikingly illustrated by the Lumière, Joly and Ives-Cros processes of color photography (see

Color Photography), in all of which three photographs taken through red, green and blue filters are dyed with these respective colors and then presented simultaneously to the eye. Ives and Cros used three separate filter screens, Joly ruled a single one with lines alternately red, blue, green, and Lumière formed the screen directly on the sensitized plate by spreading it with a thin paste containing potato starch grains, some of which were stained red, some green and some blue.

The reasons for the facts in the above group are unknown. But by assuming a certain functioning of the retina we can form a theory which will correlate them. Like every theory this is outside of the region of fact and non-fact and is simply a mechanistic formula by means of which a whole class of phenomena can be stated in terms of a selected few. The Young-Helmholtz method of explaining color vision (see Vision) hypothecates the existence of three sets of nerves in the retina: one is strongly stimulated by the red–orange end of the spectrum and less by the rest, another most strongly by the yellow–green region and less by the ends and the third by the violet–blue end and rapidly less as we approach the red end. It is then assumed that when all three sets of nerves are acted on in about the same degree the sensation of white is produced because it is a fact that red plus green plus blue does produce white. Consider now the superposition of yellow and blue lights; according to the theory yellow stimulates red and green because red plus green equals yellow. Therefore yellow plus blue equals red plus green plus blue equals white. This does not tell why yellow and blue cause white but it enables us to predict it without experiment. If however it can be shown directly or indirectly that the eye really does contain such nerves the Young-Helmholtz theory at once enters the realm of fact. It may be interesting to note that the whitening of linen and cotton fabrics by bluing in the laundry consists in adding hardly perceptible traces of indigo or Prussian blue to the ivory yellow tint to which they revert after being washed; it is essentially not a bleaching process.

Maxwell's color wheel affords a simple and interesting method of experimenting with additive combinations. It owes its present form and use to J. C. Maxwell although it was known to the astronomer Ptolemy in the 2d century and was rediscovered by the Dutch physicist Musshenbroek in the 18th. A smooth, stiff pasteboard disc graduated at its circumference into 25, 50 or 100 parts is mounted on the shaft of a small electric motor which can be operated by a single dry-cell. A circular piece of paper painted, for instance, half vermilion and half emerald green is placed over the shaft against the disc and a small wooden sleeve is then forced on so that paper and disc may turn with the axle when the motor runs. When the painted disc turns red and green are presented alternately to the eye and if the alternation is so rapid that one color occupies the place of the other before the retinal impression of the latter has vanished then both stimuli act at the same time. The resultant color will be yellowish: not pure yellow, because the pigments are not monochromatic. Maxwell introduced single-colored discs, each one perforated at the centre and slit along a radius; two or more such discs can be slipped over one another and adjusted to expose to view sectors of any desired angle. They may be cut out of the Bradley colored coated-papers; a complete set will consist of the following colors: red, orange, yellow, green, blue, violet, black, white and neutral gray and should be made in two sizes, one about twice the diameter of the other. Dividers, into one leg of which a needle sharpened to a chisel edge is set, form a convenient instrument for cutting circles. If the motor is small the discs should not be much more than two inches in diameter, otherwise air resistance will retard the rotation enough to produce flicker. This resistance varies as the fourth or fifth power of the diameter depending upon whether the speed is low or high, and is therefore 16 to 32 times as much for a four-inch disc as for one half the size. The discs must be put together so that the radial edges do not catch the wind.


Maxwell Color Discs

Very instructive experiments may be made by putting together a colored disc with a black, a white or a gray one. The brightness or luminosity of a color may be diminished by rotating black with it; this produces a shade such as would be seen in lessened illumination but does not reduce the hue or the saturation. The saturation may be lowered by using a white disc; the resulting colors are tints. But if a neutral gray and a colored disc of equal luminosities are rotated simultaneously the saturation will be lowered without change of hue or brightness. In short, black absorbs all colors and therefore changes only the amount of light reflected from the composite disc; white reflects all and, in effect, adds the physiological primaries to the disc; gray may be regarded as a mixture of black and white (or also, as will be seen presently, of other pairs) and is thus more luminous than black and more saturated than white. Ogden Rood succeeded in matching almost 500 colors with combinations formed of seven discs painted with the following water-color pigments, the numbers in parentheses being the wave lengths, in microns, of the corresponding spectral hues: matt white (zinc oxide), matt black (lampblack), vermilion (0.644), mineral orange (0.614), light chrome yellow (0.585), emerald green (0.521), artificial ultramarine (0.425). His formulas are given in the 'Standard Dictionary' under *spectrum.* The wave lengths of the Bradley papers are: red, 0.657; orange, 0.608; yellow, 0.579; green, 0.516; blue, 0.469; violet, 0.421. Consult also Bradley, Milton, 'Elementary Color' (1895).

Some pairs of discs produce gray which must be regarded as a shade of white, or so to say, as a dark white, due to the comparatively low luminosity of the pigments; the corresponding spectral hues, being monochromatic and of greater brightness, produce real white. Two colors whose addition produces white are called physiological complementaries; their number is unlimited. Physiological complements depend of course upon the source of illumination, for if the subdued white which they produce in daylight be examined in some other illuminant it will partake of its color. Additive combinations in general tend toward white; if actual lights are superposed the luminosity of the resultant equals the sum of the luminosities of the components, but on the color wheel the resultant has a luminosity equal to the average (weighted mean) brightness of the sectors. When the eye is stimulated to fatigue by any hue, say red, its complement is subjectively called up because the eye then sees all the constituents of white except red. Now since red and green make white, and all the spectral hues together also make white, white minus red equals green; that is, green is complementary to red.

ADDITIVE COMPLEMENTARY HUES

Wave lengths, μ		Colors *	
0.6562	0.4921	Yellow,	Genuine ultramarine.
.6077	.4897	Green-yellow,	Artificial ultramarine
.5853	.4854	Gamboge,	Cobalt blue.
.5739	.4821	Red,	Green-blue.
.5671	.4645	Orange,	Cyan blue.
.5644	.4618	Green,	Purple.
.5636	.4330		

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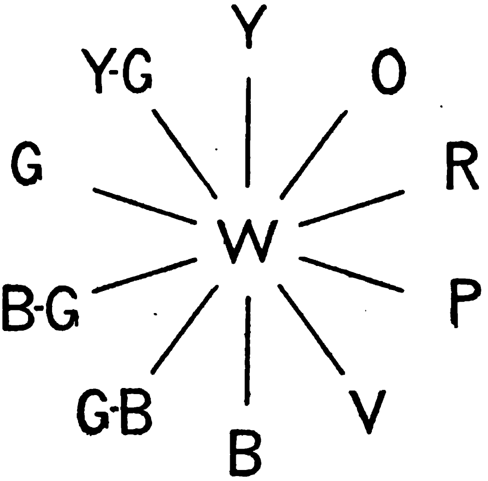
* The names do not correspond to the wave lengths at the left.

Subtractive Combinations.— When two pigments are mixed each subtracts from white light those elements it cannot reflect. The resultant hue is therefore never identical with the corresponding additive mixture and is usually entirely different. It was known to antiquity that any color may be fairly matched in hue although not in purity by proper mixtures of yellow, blue, red. These are the pigment primaries; to them white and black must be added to lighten or darken the hues to be produced. The production of all colors by combinations of the subtractive primaries is beautifully illustrated in the three-color process of printing in ink reasonably faithfully copies of paintings (see illustrations accompanying the article, PROCESS). A mixture of yellow, blue and red in about equal intensities gives the effect of black because they absorb practically all the constituents of white light. If this black is spread thinly as a tint it becomes gray. In general, mixtures of pigments tend toward blackness on account of the absorption of color and thus of light.

Pigment primaries have complementaries; thus red and green, purple and yellow, blue and orange are complements and produce black or gray according to the density of the mixture. This gray is to be regarded as a tint of black, that of additive complements as a shade of white; the difference between the grays is of the utmost importance and is by no means a verbal quibble. A small amount of a color added to its complement dulls or grays the latter; such grayed hues are among our most beautiful colors and are used with wonderful effect, for instance in textile fabrics and pottery. Unusually handsome charts illustrating pigment mixtures have been prepared by commercial firms of Boston and New York.



Rood's Color Circle

Contrast and Harmony.— The effect which two colors have in modifying each other's hue when they are placed in juxtaposition has been determined with reasonable certainty. It can be studied by putting colored strips of paper next to each other or by placing a small piece on a larger one. The general result of such experiments is that each color becomes tinged with the complement of the other, or rather is moved nearer the complement. The diagram above was invented by Rood for predicting these changes. Diametrically opposite colors are physiologically complementary. If yellow and red are placed side by side the hue of each shifts around the circle toward the complement of the other, i.e., yellow becomes greenish, red becomes more violet or less red. In the case of red and blue, the red becomes tinged with orange and the blue looks greenish. Complements intensify each other. Whether or not these effects are agreeable depends on idiosyncracy and circumstance. Red makes yellow look greenish; this may be pleasant or not — or neither — in; say, a wallpaper design. But a sallow-complexioned woman does not wear a red dress unless she wants to look bilious; green clothing would make her look ruddier unless some of the green were reflected to her face, in which case red would have been better. The question is not quite as simple as Rood's circle, for the influence of the complement is not evident when two equal areas are separated by any third color; furthermore, a small area has no noticeable effect on a much larger one. Chevreul, Rood, Church, Bruecke and others have found from examinations of paintings, ornaments, etc., of generally accepted beauty that the following pairs and triads are considered to be harmonious and pleasing.

Good pairs: red, blue; red, blue — green; orange, green — blue; yellow, violet; yellow, black.

Good triads: red, yellow, blue; red, yellow, green — blue; orange, green, violet; white, yellow, violet.

The following are to be regarded as bad:

Bad pairs: green, blue; yellow, green; violet, red; violet, blue; crimson, orange; orange, yellow.

It will be seen on comparing these combinations with the diagram that colors which do not go well together, e.g., green and blue, are adjacent in the circle while good pairs and triads, e.g., red, yellow, green, are separated. Tints, shades and grays, being less colorful or vivid, form less offensive combinations and are easier to harmonize. By generalizing the foregoing results we arrive at some of the various methods of harmonizing colors; they show rather how to avoid discord than to produce beauty.

Harmony by Contrast: use of complements in pure hues, tints, shades or grays. An example of this is the use of red (figure, chimney, etc.), in a green landscape.

Monochromatic Harmony: tints, shades and grays of a single hue as in the different greens of a landscape. This includes harmony by variation or gradation. Ruskin in 'Elements of Drawing,' says "The victorious beauty of the rose as compared with other flowers depends wholly upon the delicacy and quality of its color-graduations."

Harmony of Analogous Colors: tints, shades or grays of components which are side by side or close together in the color circle, for instance in autumn leaves which contain various tones of yellow, orange, red, brown and intermediate colors. The effect is usually not pleasing when the normal hues are employed yet the beauty of green trees, blue sky and blue-green water furnishes a striking exception to the rule.

Chevreul, director of the Gobelins tapestry works, published in 1839 a great many rules or laws of harmony which are merely detailed developments of those above. Unfortunately all such results as these are debatable, for the question of a good or bad combination depends on the individual's training and susceptibility; if he has been taught either explicitly or by his environment that this or that is bad he is likely to believe it. Association also is not without influence; "loud" clothes are considered incompatible with dignity and gaudy wallpaper is regarded as "cheap," Southern or Oriental. In consequence of this we have the strange fact that brightly colored things more often than not cost less than those more delicately colored although so far as color and design are concerned the difference in cost of production is negligible. If the prices of, say, wallpapers were reversed — the cheaper being made the more costly — it is safe to predict that a noticeable reversal of taste would take place. Other important factors which determine the beauty of a color scheme are texture of surface, quantity, composition and design; thus silks, on account of their lustre, may be handsomer than cottons, but the same hues in crayon, because of their lack of shine, may be better than in oils. Moreover, the difficulty with rules of taste is that they tend to create and thus to trammel it. Many interesting illustrations of actual color schemes are shown in Vanderpoel, 'Color Problems.'

Strong contrast in colored signs and signals is not as closely related to legibility as might be expected. Observations on advertisements led to the following results which are arranged in the order of decreasing legibility; it is possible that they are influenced somewhat by personal equation (*Scientific American Sup.* 2 Feb. 1913): Black on yellow, green on white, red on white, blue on white, white on blue, black on white, yellow on black, white on red, white on green, white on black, red on yellow, green on red, red on green. (See PAINTING; PIGMENT). Consult, besides the references given above, Jorgensen, 'The Mastery of Color' (2 vols., with 22 colored plates, showing about 1,000 colors, Milwaukee 1906); Luckiesh, 'The Language of Color' (New York 1918); Ridgway, 'Color Standards and Color Nomenclature' (with 53 colored plates and 1,115 named colors, Washington, D. C., 1912).

R. F. DEIMEL,
Assistant Professor of Mechanics, Stevens Institute of Technology, Hoboken, N. J.

COLOR IN ANIMALS. See COLORATION PROTECTIVE.

COLOR-BLINDNESS, *Achromatropsia,* popularly known as *Daltonism,* a singular affection, producing an inability to distinguish one color from another, and in certain rare cases to discern color at all, the eye perceiving only light and shade, or black and white. Although recognized for centuries, its modern study dates from the time when the famous English chemist, Dr. Dalton, brought it into notice by publishing in 1794 an account of his own case as marked by this peculiarity. More recently, Dr. George Wilson of Edinburgh also examined minutely into this phenomenon, and collected many striking instances. From the result of these investigations it would appear that color-blindness is much more common among men than among women, and that of the former 1 in 20 is unable to discern the nicer shades of color, and 1 in 50 to distinguish certain primary colors from one another. The colors most liable to be confounded are red and brown with green, purple and green with blue, red with black, light hues of all sorts with white, and dark shades with black. Color-blindness may be either congenital or acquired. The latter is believed to be an affection of the optic nerve and retina, may result from disease or accident and may be caused by the excessive use of tobacco, alcohol or other drugs. It sometimes happens that persons having contracted color-blindness may be able to distinguish colors accurately when they are near at hand, while they are not able to do so when they are at a distance. Congenital color-blindness is frequently hereditary and generally exists in both eyes. Sometimes it exists only in a slight degree, at others it is found in a marked degree, while in others it is complete; generally, however, it is only partial; that is, the person affected fails to distinguish properly one or two of the fundamental colors, red, green and blue. Based on these known facts and on extended investigations and experiments, several theories have been advanced to account for and explain color-blindness. One of these, the Hering theory, maintains that the retina contains three pairs of visual materials, namely, white-black, red-green and blue-yellow. According to this theory color-blindness results from one or more of these materials. The Young-Helmholtz theory, on the other hand, maintains that there exist in every normal person three primary perceptions, red, green and violet, in the absence of any one of which the sense of color is defective; and the resulting missing color seems to be composed from the others. This theory is based partially on the fact that the most common forms of color-blindness are green, red and red-green blindness. Various tests have been arranged for the detection of color-blindness, the best of which are those devised by Professor Holmgren of Upsala, Sweden. They consist of skeins of wool of certain «test colors,» including various tints and shades of the same colors. These the person under examination is required to match.

Very stringent laws have been passed in most modern civilized countries to prevent color-blind people from occupying positions where their defective vision might endanger the lives of others. Sweden was one of the first countries to make laws for the protection of the traveling public against the danger arising from the employment of people affected with color-blindness in the railway service. As early as 1877 a law was passed in Sweden requiring that only people of normal vision for color should be employed in the railway service of the country. In the United States, Great Britain (and all her colonies), Germany, France, Italy and Austria provisions of some kind have been made to protect the traveling public from the danger of color-blind employees in the service of the railways. Consult Holmgren, ‘De la cécité des couleurs’ (1877); Thompson and Weiland, ‘Detection of Color-blindness’ (in ‘System of Diseases of the Eye,’ Vol. II, by Norris and Oliver, Philadelphia 1897); Posey and Spiller, ‘The Eye and the Nervous System’ (Philadelphia 1906); Eldridge-Green, ‘Color-blindness’ (1911); Parsons, J. H., ‘Introduction to the Study of Color Vision’ (1915).

COLOR PHOTOGRAPHY. From the earliest days of photography efforts have been made to reproduce pictures in the colors of nature, wholly through the aid of sensitized plates and the camera. It was found as long ago as 1801 by Ritter, of Jena, that the various rays of the spectrum differed considerably in their action on silver chloride, and in 1810 Seebeck, also of Jena, obtained a reproduction of the spectrum, in some approach to natural colors, on paper coated with silver chloride. These images could not, however, be fixed. In 1891 Lippmann laid the foundation of the process known by his name, which is based on the theory of Zenker and work of Wiener, with due acknowledgment to both. This is distinguished as an «interference» process, the effect being produced by decomposition of the light.

The apparatus employed for the production of the picture is very simple, differing but little from that used for ordinary photography. Any transparent sensitive film answers as the photographic surface. This film is exposed in an ordinary camera, having the plate backed by a layer of mercury as a mirror. A slide is so arranged that mercury can be allowed to flow into a space back of the plate after the plate has been placed in the slide. After exposure, the mercury is allowed to flow out and the plate is then developed in the usual way.

The materials on the finished plate are the same as those on an ordinary negative, but a difference exists in the structure of the deposit, by which it is enabled to decompose the light by which it is illuminated and reflect those portions of it which correspond to the natural colors of the object from which the picture was taken.

The reason for the formation of this structure as formulated by Lippman is that the light waves, as they pass through a plate as ordinarily arranged, impress the plate more or less strongly, and thus leave a design of different intensities of the image, but in this rapid passage they leave no record of their own forms. Each ray of light of a certain color has a certain structure; it is made up of waves which have a certain wave-length. If there be a mirror behind the plate, the light, says Lippman, is reflected back on itself; the light rushes in and rushes out again with the same velocity; the entering and issuing rays interfere, and the effect of the interference is that vibration takes place; but the effects of propagation are stopped, and instead of having propagated waves we get stationary waves; that is, the waves now rise and fall, each in its own place; they pause, therefore, in the interior of the film and impress their form upon it.

On looking through a film obtained by the Lippman method it appears like an ordinary negative; its color effect is obtained only when viewed by reflected light, different portions of the plate reflecting different colors according to the light-waves by which it had been impressed. In order that the interference colors may be seen so that they are true to nature, the plate must be viewed by vertical incidence, which is inconvenient. They may be projected by an arrangement devised for the purpose.

In 1861 Professor Maxwell showed at a lecture at the Royal Institution that by taking photographs of a colored ribbon through three solutions colored to represent the primary colors, and then projecting these photographs so that their images were superposed, a colored image of the ribbon was given, which was faulty, however, from lack of photographic materials more sensitive to the less refrangible rays. In 1873 Professor Vogel announced that dyes would influence the distribution of color-sensitiveness in plates.

On these facts are based the process of Ives, brought out in 1892. In his process three negatives are obtained through color-filters; from these positive transparencies are made (in monotone), which are placed in a special viewing instrument, each in combination with its properly adjusted color-screen; these being then combined, the images are seen in the original colors of nature.

For a proper understanding of the method developed by F. E. Ives, see COLOR PRINTING.

The next development in this method was the introduction of the process worked out by Professor Joly in 1894. This differs considerably from the Ives method in the manner of working, but in principle it is very similar. Only one negative, instead of three, is required, but this is taken through a transparent lined screen, ruled very finely and closely with parallel alternate lines of orange, yellowish-green and blue. After development a positive transparency is made from the negative, which, when mounted accurately and in close contact with a viewing-screen similarly ruled with parallel lines of red, green and violet, the image is seen in its original colors. These mounted positives are usually viewed as lantern-slides, but are somewhat marred by the obtrusiveness of the lines when seen too closely.

To go back to the underlying principle of the three-color process — the "filtering" out of certain rays in taking the different plates — it is understood that the primary colors from which white light is formed are now set down as a particular shade of red, a particular green and a particular blue-violet. The primary pigmentary colors, it may be added, are red, yellow and blue, as has always been taught. If we obtain three negatives from an object, each taken through a color-filter or screen adjusted for the red, the green and the blue-violet respectively, these plates will present negative images of the object in the negative values of the colors named. When from each of these negatives there is produced a positive in the complementary color, and these positives are placed in accurate registration, there results a reproduction of the original object in the colors of nature. The ordinary photographic plate is not sensitive to all the rays. If the addition of certain colored substances, chiefly aniline compounds, be made to the emulsion, these apparently combine with the haloid silver salt to form an organic compound of silver which is sensitive to the light reflected from various colors according to the particular dye employed; and in this way it is possible to obtain a plate which will be sensitive to the light reflected from all the colors of the spectrum, though for convenience in working the extreme red is generally excluded, or otherwise the plate could be made and handled only in complete darkness.

In the working of the three-color process the negatives are taken through color-screens of red, green and blue-violet, adjusted for use with a spectrum plate. By means of a repeating back, used in connection with a frame containing the screens, these may all be taken upon one plate; that is, when the size of the picture required is small, such as is suitable for a lantern-slide. The length of exposure varies with each of the screens, an ordinary ratio being, say, 55, 13, 4 for the red, green and blue-violet respectively; but on account of unavoidable variations in different batches of emulsion, largely due to the difficulty in obtaining gelatin of uniform quality, these ratio exposures are liable to differ, but can be readjusted without great difficulty by making a trial exposure upon some subject with well-marked high lights and half-tones, such as a crumpled piece of white blotting-paper, which should appear equal in all three negatives. The length of the exposure through the red screen may be gauged by a fraction tint actinometer, by timing to a certain tint; from the time thus obtained the remaining two exposures can then be calculated from the ratio numbers.

There is a special form of camera in which the exposure for the three negatives can be made simultaneously by means of mirrors. The plate must be developed either in darkness or by a special "safe" light supplied for use with such a plate, and a developer of the rapid type should be used, yielding a soft negative of good gradation without stain. Correctness of exposure is essential, forced development being almost certain to result in failure. Intensification and reduction can be effected only at great risk of interfering with the gradation of the image, and should never be resorted to unless it is impossible to make another exposure. The best intensifying reagent is said to be mercuric iodide with sodium sulphite.

The next step is the production from the negatives of the three positives. From the negative obtained through the red color-filter, there is produced a greenish-blue positive. This, in the Sanger-Shepherd process, is done by first making a lantern-slide positive in the ordinary way by contact, taking care to secure one of good quality and well representing all the detail and gradation in the negative clear and free from fog, for the density and detail of the finished slide will largely depend upon the blue positive. This, after fixing and washing, is treated with a solution of potassium ferri-cyanide, again well washed, then immersed in a solution of ferric salt, rinsed, and replaced in the fixing solution, and finally again washed to free from hyposulphite. The effect of this is to convert the deposit of silver into one of Prussian blue. When dry, this plate should be varnished, preferably with a solution of celluloid.

The remaining two positives, the pink and the yellow, are produced by modifications of the carbon process. A celluloid film coated with an emulsion of silver bromide in soft and soluble gelatin is employed. This is sensitized by immersion in a solution of potassium or ammonium bichromate, and, when dry, printed in contact with the two other negatives, care being taken to place the celluloid side next the film side of the negative. The necessary exposure varies from 1 to 10 minutes, according to the light, and should be gauged by means of the fraction tint actinometer. The silver bromide takes no part in the formation of the image, its functions being to afford some guide in the exposure and development by giving a faintly visible image, and to assist in the more rapid disintegration of the gelatin in the warm water used for the development. The water used should be of a temperature of from 90° to 100° F., as in the carbon process, and when all the soluble portions which have not been acted upon by light are removed, the silver bromide is dissolved out by a solution of hyposulphite, leaving the almost invisible photographic image in relief in clear gelatin. The positive thus obtained from the negative taken through the green filter is then immersed in a dye-bath of a pinkish-red color, and that from the negative taken from the blue-violet filter in one of a yellow color, and they are stained to the required depth, comparing the result, by holding in approximate position occasionally with the blue positive, without touching each other. It is usually better to overstain these positives and then wash down in water to the required depth of color.

The blue positive may be obtained in similar manner upon a thin celluloid support, using a weak solution of methylene blue as the stain, and this method is preferred by some workers. The advantage, however, rests with the prussiate process, in that a positive is produced of maximum sharpness, being printed in actual contact, without the necessity for the interposition of the celluloid, this being more essential in the case of the blue print, which forms the foundation of the finish slide, for however slight the diffusion may be, it must necessarily be more apparent if it exists in each of the three monochromes.

In the method of working recommended by Messrs. Lumière the three stained positives are produced upon a mica support. The mica has the great advantage of rigidity, but the still greater disadvantage of frequently failing to retain the gelatin film, which will sometimes float off, even in the bichromate sensitizing solution.

But all these methods have proved commercially useful only as assisting the production of tricolor printing plates. For producing actual color photographs to be handled in the ordinary way, they have been commercial failures.

It has remained for Frederick E. Ives to perfect and market a satisfactory photograph in natural colors, produced wholly by mechanical means. He first obtained three impressions of a picture on glass, in such manner that when superimposed and backed by a light they gave the effect of a single picture in colors and could be thrown on a screen with a lantern. It will be understood that one of the three impressions of this composite picture represented the yellow, one the red and one the blue rays. Having demonstrated the practicability of thus rendering the triplate visual, Mr. Ives next set himself the task of producing the three color plates in the camera at one exposure. This was the supreme task, the successful accomplishment of which crowns him as the perfecter of the art of color photography. Three plates must be arranged in one camera with such filters and light effects that one plate should reject the red and blue rays, gathering the yellow only; one plate reject the yellow and blue, gathering only the red; and one reject the red and yellow, gathering the blue. He succeeded with what he terms the Tripack process. Three glass dry plates are set up in a special holder. The camera is provided with a thin glass plate set at 45 degrees as a reflector and color filter. The blue plate is placed in the bottom of the camera and receives its light by reflection on exposure. The other two plates are placed vertically at the back of the camera, receiving the rest of the light, reflected and filtered for color. One of the vertical plates has to be placed in reverse, but this proves no disadvantage. The combination is such that the desired three negative plates are obtained at the one exposure. To reproduce for use and exhibition, prints from these, three color-record negatives are made on sheets of celluloid coated with gelatine. These sheets are stained with dyes, cemented together and mounted between two sheets of glass, forming one transparent photograph of superb beauty, in natural colors, that is viewed by being held to the light. The negatives produced by the original exposure, if treated in a different way, may be used to make three-color plates for ordinary tricolor printing. See Color Printing; Photography.

A method of printing silk fabrics by color photography, due to Messrs. Valette at Féret, of the Manufacture Nationale des Gobelins, France, presents results which appear to be interesting in the sense that the process makes possible the production on silk fabrics of decorative effects the perfection of which does not seem to have been hitherto attained by printing. The method is of course borrowed from color photography, and consists in making three successive impressions — blue, yellow and red — from three selected photographic, prepared plates. The fabric is rendered sensitive by the aid of mixtures of alkaline phenols and diazo sulphites, products which possess the property of giving coloring matters only through the influence of light. The precision needed in superposing the three impressions is secured by carrying out the work on a special frame, the fabric having been previously provided with metallic eyelets to avoid tearing it. The development of the colors is accomplished with better regularity by exposing to electric light. The method is recommended by its authors as more especially applicable in the treating of articles de luxe of the sort that cannot well be printed by machine.

Charles H. Cochrane,
Founder of New York Master Printers' Association.

COLOR IN PLANTS. The prevailing color of vegetation is green, owing to the presence of *chlorophyll* in all external tissues not turned to wood or bark. This is a green substance produced in and necessary to all the growing parts of plants exposed to sunlight; but the flowers and fruits of many families as well as the whole form of seaweeds, lichens and fungi, often exhibit brilliant hues; and some lowly groups, as the molds, etc., are white, or nearly so, because they do not contain chlorophyll. Chlorophyll is green because, as the spectroscope shows, it absorbs the red and blue rays in the sunlight, and leaves only the remainder of the visible rays of the spectrum to come to our eyes, and these, in combination, affect us with a sense of green. The red and blue rays stopped by the chlorophyll are the ones useful to the plant, for it is only their vibrations that are able to break up the carbon dioxide breathed in by the plant-leaves, and to separate its constituents into sustenance (carbon) and waste (oxygen). Chlorophyll, then, is not a true pigment, although it produces the most universal color in nature.

Many leaves and other surfaces of plants do contain, however, a true, reddish pigment, sometimes so abundantly as to redden a whole part or even an entire plant, as is seen in seaweeds. The excessive development of the property by artificial cultivation gives the gardener such gay vegetables as red cabbage, the gaudy foliage-plants, and such shrubs or trees as the copper-beech. This red pigment is *erythrophyll* (or *anthocyan*), and when dissolved out in hot water it shows a beautiful rose tint. It appears strongly in leaf-buds as they begin to shoot forth in spring, and in the earliest of the growing twigs that in March give a ruddy tone to thickets in advance of the leafing. Several explanations of its supposed usefulness to the plant have been offered, while others treat it as merely a chemical incident of no particular utility.

The same sort of red reappears in the rich colors that beautify our woods in autumn, when there also becomes strongly manifest in the "turning" leaves another coloring-matter, the bright yellow pigment, *anthophyll*, which is always present in plants, but in very minute quantity. These reds and yellows show themselves plainly in the fall because stimulated by chemical reactions as the chlorophyll disappears with the slow decay of the leaf; and their presence seems to have little if any utility in the economy of the plant.

Turning now to the variegated and often vivid coloring of flowers and fruits, we enter the domain of the relation between plants and insects. The blossoms of primæval vegetation seem to have been virtually colorless, and this condition persists in those, like the grasses, etc., which are fertilized by means of the wind. Night-blooming flowers, and those growing in shaded places, are usually white — the most conspicuous hue in a dusky light. Most flowers, however, are now more or less brilliant in color, and there is evidence that this is a characteristic that has been gradually acquired, along with other characteristics, the effect of which is to increase the likelihood of the flowers being visited by insects, and thus obtaining an exchange of pollen with other plants of the same kind. Colored flowers become conspicuous amid green leaves, and, aided by odor, serve as signs of the presence of the sweet food (nectar) that insects seek and must have. Many simply constructed blossoms have only a uniform tint, as the plain yellow of the evening primrose; but more, probably, have a complicated structure and are varicolored, especially in a striped way on the inside of the corolla. It is found that in these cases the lines of color lead straight to the nectary and thus indicate the pathway for the insect to follow. The benefit to the plant is, of course, that by following that route the insect is sure to deliver any pollen it may have brought, and will be dusted with more for delivery to the next blossom visited.

ERNEST INGERSOLL.

COLOR PRINTING, the art of reproducing pictures, designs, letterpress, etc., by any of the processes of printing, in two or more colors. It may be divided into — (1) primitive color printing, as Japanese brushwork from color blocks; (2) chromolithographic printing, in which colors are superimposed by lithographic processes (see LITHOGRAPHY); (3) offset printing in colors (see PRINTING); (4) typographic color printing, done from type or relief plates, by typographic mechanisms. As a subdivision of typographic color printing, the tricolor process of reproducing in natural colors by photo-engraving forms practically an art by itself.

Japanese Color Printing.— The modern survival of primitive color printing is found in the brushwork from color blocks produced by the Japanese and Chinese. These are sold for a small price in the shops of Eastern cities. They represent the combined work of an artist, engraver and printer. The artist makes a brush drawing on paper of local manufacture produced from rice or bark fibres, laying on the color in masses. The engraver pastes this color drawing on a printing block, usually made of wild cherry (*Yamasakura*) wood. With chisels and gouges rudely resembling the tools of the Western wood engraver, he cuts the main outline of the design on the wood, thus making this the key-block of the resultant picture. In cutting the block into relief he destroys the drawing, but the body tints show on the wood, to guide him in engraving blocks for the other colors. A proof of this first key-block is taken on paper, and transferred to another block, on which the red portions of the picture are reproduced. A blue and a yellow, and perhaps other color blocks, are produced in the same way. Register or correct superposition is secured by cutting an L nick in one corner of the proof of the key-block, and of all reproductions, so that they can be laid in similar position on all the blocks of a series. To prevent the blocks from warping, dovetailing is employed. The printer takes the set of color blocks, and with dampened bark paper proceeds to printing one color at a time, inking the block with a brush, dexterously laying on the sheet with the L nick to secure accurate position or register, and impressing the sheet on the block by rubbing, in a manner somewhat similar to the taking of a burnished proof by a modern engraver. The rubber is a ball of hemp thread. Ground vegetable and mineral substances are used for color pigments. When all the colors are on, a wash of rice paste is sometimes added to give a brilliant effect. By such primitive methods the Japanese printer can produce about 100 to 125 impressions per hour. If the pictures are in four colors, he can thus print 25 to 30 complete copies per hour.

Two-Color Printing.—This is accomplished typographically, either by two separate printings, as in black and red ink; or by the use of a two-color press, on which the sheet is fed first to a form inked with one color, and then to a second form inked with another color. Thus the two colors are produced at one operation though not simultaneously. Booklets and circulars, and sometimes sections of magazines are now commonly printed in two colors rendering them more attractive. Duographs, or half-tones in two colors, are produced by this method.

Three-Color (or Tricolor) Printing.— As early as 1704, it was known that the three primary colors, yellow, red and blue, could be printed so as to produce theoretically all color combinations. Jacques Christophe le Blon, born in Frankfort in 1670, made beautiful three-color prints, which he styled mezzotints, and which sold for the equivalent of $125 to $165 each. In 1722 he published a book titled 'Il Colorito,' which demonstrated that he had a conception of the color theory. He kept his process a secret, but took it to London, where a company was formed that exploited it with considerable profit. The first American three-color printing by the modern half-tone process, from a relief block, was the work of William Kurtz, and appeared as a frontispiece in the *Engraver and Printer*, of Boston, in 1893. The modern tricolor process from half-tone plates mechanically made is the joint product of the photo-engraver and printer. The photo-engraver makes three plates of the one subject, using color-screens to shut out the other colors from each plate. These three plates, printed one in yellow, one in red and one in blue, superposed, on a typographic press, constitute the three-color pictures produced by commercial printers. The story of the development of this modern process is best told in the words of the following paragraphs by Frederick E. Ives, the most conspicuous and prolific inventor in this field.

Description of the Three-Color Process.— The «three-color process» and the «tri-chromatic process,» are the names given to an indirect process of color photography and color printing which has been successfully developed in various applications. The first modern suggestion of such a process was made by Prof. James Clerk-Maxwell, in 1861 or before, and the principle was reinvented and elaborated by Louis Ducos Duhauron and Charles Cros in 1869, but the results obtained experimentally were unpromising, and owing probably to this fact and also to the existence of a general prejudice against the idea of color photography by any but a «direct» process, the subject received but little further attention until F. E. Ives, in 1888, stated a new and definite principle of photographic color selection, and gave a successful public demonstration at the Franklin Institute, in Philadelphia. This was followed by a great revival of interest and active experiment ,and the commercial development of the process in various applications. The first step in this process is the production of three photographic negatives which constitute a record of the color values in terms of spectrum red, green and blue-violet lights, these being the only spectrum colors which will by admixture in various proportions reproduce all other colors without material degradation of purity. Such sets of negatives are made by exposing color-sensitive photographic plates in the camera through selective «color screens.» Formerly a special red sensitive plate was exposed through a red or orange screen, a green sensitive plate through a green screen and an ordinary plate through a blue or violet screen. Following Ives, most authorities now recommend the use of only one kind of plate, sensitive to all colors, in order to ensure uniformity of gradation and density in the three images with simultaneous development. The equalization of the exposures, also an important element of success, is best accomplished by the use of special cameras, which form the three images simultaneously, from one point of view. Several such cameras designed by Ives make the three images, identical in size and perspective, side by side upon one plate, at one exposure, thus making the negative process as simple as it is in monochrome photography.

From the photographic negatives thus obtained, which record the colors only by differences of density and gradation in the separate images, colored pictures can be made by two synthesis methods, one «positive» and the other «negative.» In the method of positive synthesis, red, green and blue-violet lights, in terms of which the three negatives have recorded all the colors of the objects photographed, are used to illuminate three positive «black and white» images made from the negatives, and these three images are then optically blended to form a single image, in which the colors mix to reproduce to the eye the colors, form and light and shade of the objects photographed. Such optical synthesis is effected either with three magic lanterns or their optical equivalent, or with an instrument called a photochromoscope, which is used like a stereoscope. In the stereoscopic photochromoscope of Ives, the reproduction is so perfect that the objects themselves seem to stand before the eyes. In the method of negative synthesis, positive color prints are made from the three negative images, and superposed in white light, or upon a white surface. It is an interesting fact that the colors used in printing are not the red, green and blue-violet photographing colors, but their complementary colors, a peacock blue, a crimson pink and yellow, commonly but incorrectly called «blue,» «red» and yellow. This is because the printing process makes and mixes shadows instead of lights, being complementary to the method of reproducing colors in the photochromoscope.

The negative made through a red screen must print a positive, uncolored in its high lights and peacock-blue in its shades. The negative made through a green screen must print a positive, uncolored in its high lights and crimson-pink in its shades. The negative made through a blue screen must print a positive, uncolored in its high lights and yellow in its shades. It is also important that these colors be perfectly transparent. When these prints are superposed, equal parts of all three colors form blacks and grays, and the pure colors, red, green and blue-violet, appear where yellow is superposed on crimson-pink, peacock-blue on yellow and crimson-pink on peacock-blue. Unlike the method of positive synthesis, no method of negative synthesis fulfils all theoretical requirements in ordinary white light, and if the process is employed to reproduce as difficult a test as the spectrum itself, it must fail to do full justice either to gradation of hues and luminosity values or else to purity of color. The degradation of purity of color resulting when the analysis perfectly differentiates all hue and luminosity values, as in the original method of Ives, is not so considerable as to appear objectionable when perfectly transparent and correct printing colors are employed; on the other hand colors showing diffuse absorption in the spectrum are often pretty correctly reproduced with an analysis in the negative process which, while favoring brilliancy of color in the reproduction, would fail to secure a passable representation of the spectrum. Consequently, authorities, having different opinions as to what qualities are most desirable in a reproduction, must and do disagree as to what is the best principle of color selection for negative synthesis.

This difference of opinion is particularly justifiable in connection with the half-tone trichromatic process, thus far the most important commercial development of three-color photography, because the subjects most often reproduced have colors showing diffuse absorption in the spectrum, and the best reasonably permanent printing inks thus far obtainable are neither correct in hue nor of sufficient purity and transparency to fulfil their theoretical functions.

The first half-tone trichromatic process prints were made by Ives in 1881, but the process was not developed commercially until reinvented and patented by Albert, Duhauron and Kurtz, more than 10 years after. In this process, half-tone blocks are made from the three negatives, and printed in the type press, with the peacock-blue, crimson-pink and yellow inks. In order to prevent the production of an offensive moiré pattern, the lines of the half-tone blocks are disposed at different and suitable angles for the different colors. Owing to the complications of the process, and the theoretical imperfections of materials and means necessarily employed in its commercial operation, the printing plates are more or less re-etched in parts until proofs show the desired result, but with so little work and cost altogether that the process is competing successfully with chromolithography for many purposes, and may eventually supersede it, as half-tone engraving has already superseded wood engraving.

Four-Color (or Quadricolor) Printing.— Since some color values are lost in three-color reproduction by photography, it has been customary with many to produce a fourth plate, called a key-plate, in which the main design is emphasized. This key-plate is printed either in gray or photo-brown ink, and is usually printed the last of the series. Otherwise the process is similar to tricolor printing.

Presswork in Colors.— There is a great dearth of literature on this branch of color printing. Experience has demonstrated that ordinary printers handling black work do not secure satisfactory results when handling the printing of three and four-color plates, hence this work is done mainly in printeries devoted wholly to color work, developing into a separate branch of the printing art. One of the great difficulties of the color printer arises from the uncertainties of the paper surface on which he prints. Rough paper will not yield good results, and to secure the smoothest surface highly coated papers have come into use for color printing. If the coating is a little too heavy or too brittle, it tends to flake off, and minute specks are pulled off the paper in printing, mixing with the ink, clogging the inking rollers, and producing no end of annoyance. The great variations in humidity in American atmospheres invite stretching and shrinking of paper, and when a sheet either stretches or shrinks between the times of printing any of the colors, of course the colors will not strike exactly as they should, and exact superposition of tints becomes impossible. To avoid danger of shrinkage it is common to print the most particular color work in sheets or forms of small size; but in the effort to keep down the cost of printing large forms are desired, hence a good deal of three and four-color printing has been done on large sheets with more or less uncertainties of register. By improved methods of heating and producing uniform high heat in the pressroom these irregularities have been reduced. The modern color printer seeks to avoid loss from shrinkage by maintaining a high and uniform heat in the pressroom — 75 to 80 degrees, and by keeping the piles of paper protected from dampness by coverings. It is found best to print the colors in this order: yellow, red, blue and lastly the key-plate. In making ready for the yellow plate, a flat printing was at first employed, but it was learned that color values were thus lost, and the best practice now is to start the printing of the yellow in a dark ink, so that the pressman can see the design clearly, and bring up all parts of it sharply, before going ahead with the regulation yellow, which is hard to see when alone on a white sheet. The second color should not follow until the first is dry, and it is best to run the sheets through the press in the same order as on the first printing, rather than to reverse the order. See COLOR PHOTOGRAPHY; ENGRAVING; PHOTOGRAPHY.

CHARLES H. COCHRANE,
Founder of New York Master Printers' Association.

COLORADO, kŏl-ō-rä'do, the «Centennial State» (admission to the Union planned for 4 July 1876, consummated 1 August), is bounded north by Wyoming and western Nebraska, south by New Mexico and western Oklahoma, east by Kansas and Nebraska, west by Utah. Capital, Denver. Area, 103,925 square miles (280 of it water). Pop. 799,024.

Topography.— Eastern Colorado, one-third the total area, is the westernmost portion of the great treeless plains that continue the Kansas prairies. Near the abrupt rocky faces of the mountains, they rise in low sharp-ridged foothills, called «hog-backs,» composed of an extensive series of fresh water and marine formations (remnants of the junction of sedimentary with primary rock). The remainder of the State belongs entirely to the Rocky Mountain system. The Front Range connects the plains with the main range of the system. The western portions fall in minor slopes toward the Pacific. Colorado contains the greatest mass of high land in the United States, if not on the continent.

The main mass of the Rockies crosses Colorado in two principal lines of elevation. The eastern, or more recent line, is composed of the Medicine Bow Range, which extends into Wyoming; the Front Range, the one first encountered by the early immigrants and still crossed by the main line of transmontane travel, the Sangre de Cristo and the Culebra. The western, or main line, is composed of the Park Range from the north and the Sawatch Range, which is a continuation of the Sierra Madre of Mexico. West of these main lines lies a complicated series of broken ranges and plateaux, parallel, lateral and oblique, but with a general trend northwest and southeast. Of these the principal ones are the Roan or Book, north of the Grand River in the extreme west; the Uncompahgre parallel to the Gunnison River on the south; the San Miguel further south; the San Juan to the east; and the Elk near the centre obliquely to the Sawatch (incorrectly spelled Sagauche). The Elk is a very notable range about 30 miles long, geologically interesting from the extraordinary displacement of strata, with a number of lofty and rugged summits; Castle Peak, 14,259 feet; Maroon, 14,003 feet; Snow Mass, etc.

The best-known peaks in the State, Long's (14,271) and Pikes (14,108), noted landmarks of the immigrant trail, are in Front Range, which also contains Audubon, Arapahoe, James, Rosalie, Grays (14,341), Torreys (14,336) and Evans (14,330). The loftiest range, as a whole, is the Sawatch, a granite mass over 13,000 feet high for many miles together and from 15 to 20 miles wide. Its peaks are Harvard (14,375), Princeton (14,196), Yale (14,187), and others. After a depression of 18 miles, the range rises in the Mountain of the Holy Cross, where a deep ravine and a transverse fissure outline a gigantic cross in the snow. The highest point in the State is Mount Massive (14,424).

The great passes are far higher than any mountain summits east of the Rockies. There are several over 10,000 feet above sea-level: Alpine (13,550), Cottonwood (13,500), Argentine (13,286), Marshall (10841), Tennessee (10,418) and Fremont (11,313).

Lying between the two parallel elevations are four great parks which are separated from each other by cross ranges. By far the largest is San Luis Park, which extends into New Mexico and has an altitude of about 7,000 feet and lies between the Sangre de Cristo and Culebra ranges on the east and the Sawatch on the west and is more nearly level than the plains. It is nearly the size of Massachusetts. It is drained by the Rio Grande through the southern centre, while the mountain streams of the north flow into the San Luis Lake, the largest lake in Colorado. North of San Luis Park is South Park, between Front and Mosquito ranges, 8,000 to 12,000 feet high, and about the size of Rhode Island. Further north is Middle Park, still more elevated and somewhat larger. Lying between Medicine Bow and Park ranges is North Park, the second in size. There are many smaller parks, the most famous of which are Monument Park and the Garden of the Gods near Colorado Springs; in the latter «rise towers and pinnacles consisting of the vertical strata of the white Dakota sandstone and of the red triassic sandstone below. Some of these huge masses rise vertically for 200 or 300 feet, and serve as examples of erosion of steeply upturned strata of varying consistency. Lower white ridges of Jurassic gypsum or Cretaceous limestone afford strong contrast in color when compared with the red sandstone.»

River Systems.—The main Rocky Mountains must obviously be the greatest of American watersheds anl chief source of river systems, except Minnesota; they contain the continental divide between the waters flowing to the Atlantic and those flowing to the Pacific. One part of it is the southern boundary of North Park, the streams of which flow north to the Platte-Missouri-Atlantic system, those south of it feed the Grand-Colorado-Pacific; another is between Creede and Ouray, separating the headwaters of the Rio Grande from those of the Gunnison and Uncompahgre of the Colorado system. The eastern plains are divided chiefly between the two great systems of the Arkansas and the South Platte; the former occupies more than one-half their area in the State, the southern portion; the South Platte, the larger portion of the northern half; between them on the east is a section draining into the Republican River, an affluent of the Kansas. The South Platte rises in South Park; the Arkansas in the mountains west of it, Leadville lying on one of its head creeks. Except for these and the Rio Grande in San Luis Park, the mountain section is almost entirely drained by the Colorado River system; the Yampa (or Bear) and the White, in the northwest, flowing to the Green; the Grand through the centre, with its chief affluent the Gunnison from the south; and the Dolores in the southwest.

Of equal fame with the giant peaks and even greater beauty are the stupendous mountain canyons through which its rivers cut their way. Western Colorado forms the eastern edge of what Major Powell has called the Plateau Province; and all the wonders and beauties of this remarkable region are found in Colorado. There are the terraced platforms, ending in rock faces dropping sheer upon other platforms hundreds of feet below, and ending in vertical gorges from 1,000 feet to a mile in depth, where the sand-laden currents with a steep fall have cut their channels through countless strata of brilliantly variegated sedimentary rock; here are barren mesas, and cool grassy forested levels and slopes above the plane of perpetual drought where the mountains bar off the vapors; rock headlands around curves or junctions of streams or gullies, fantastically carved in striking likeness to the work of human architects. The canyon of the Grand, the Black Canyon of the Gunnison, the Royal Gorge, a part of the Grand Canyon of the Arkansas, are famed for their beauty and their grandeur.

Climate and Rainfall.— The dry, cool, thin air of mountainous Colorado makes its accessible eastern portions, especially the parks, widely famed as sanatoriums for patients with asthmatic or pulmonary diseases. Colorado Springs, the Rocky Mountain Saratoga, is built up by Eastern invalids. The summer days are sometimes hot, but the dry air and bare rocks cause so rapid a radiation that the nights are always cool and dewless. There is little severe winter cold, zero being rare; the frost season is short, and the snows, seldom deep, soon melt, except on the mountains. The January mean temperature for the leading places is about 28.5°F.; the July 72° to 74°F. The average rainfall is 14.8 inches, fairly even through the State, though naturally much heavier on the higher levels, varying from nearly 30 inches at Pikes Peak to 12 inches at Las Animas in the Arkansas plains. Hence, agriculture can be carried on without irrigation in many mountain regions, though better with it.

Surface, Farming, Stock Raising and Irrigation.— There are about 16,000 square miles of forested land in the State, the trees being mostly conifers, with cottonwoods along the eastern streams. Of the 40,000 square miles of plain and parks, about one-third is arable, the rest being grazing-ground, to which, however, must be added many thousand square miles of grassy mountain slope. The pasturage in many parts lasts through the winter; and the plains are covered with gorgeous wild flowers. The soil of the plains is mostly sandy loam, with some clay. Along the water-courses the soil is rich, but the rainfall is not sufficient, and irrigation is needed; but is scarcely feasible there except along a few large streams, or near the mountains. But the system of dry-farming promises to extend largely the area farmed. But there is an estimated irrigable area of 4,800,000 acres, or 7,500 square miles, in the State; and in recent years an immense amount of energy has been turned to utilizing its possibilities. Irrigation is one of the outstanding enterprises of Colorado. In 1889, 890,735 acres were under irrigation, but in 1910 there were 2,792,032 acres, an increase of 200 per cent in acreage irrigated. Colorado stands first in the arid region in irrigated area. In 41 of the 63 counties of the State more than half of the farms are irrigated. Three and one-half million acres are devoted to dry farming, the 1915 income of which was $32,902,334. Sixteen million acres are devoted to grazing. Stock feeding, a very important industry, has developed in the San Luis Valley where field-peas grow luxuriantly. In addition to the large government enterprises, there are 9,065 independent enterprises with a total ditch mileage of 22,570 miles. Of this amount over one-third is in a solid block along the South Platte, at the northeast corner of the mountains in the State; the

COLORADO

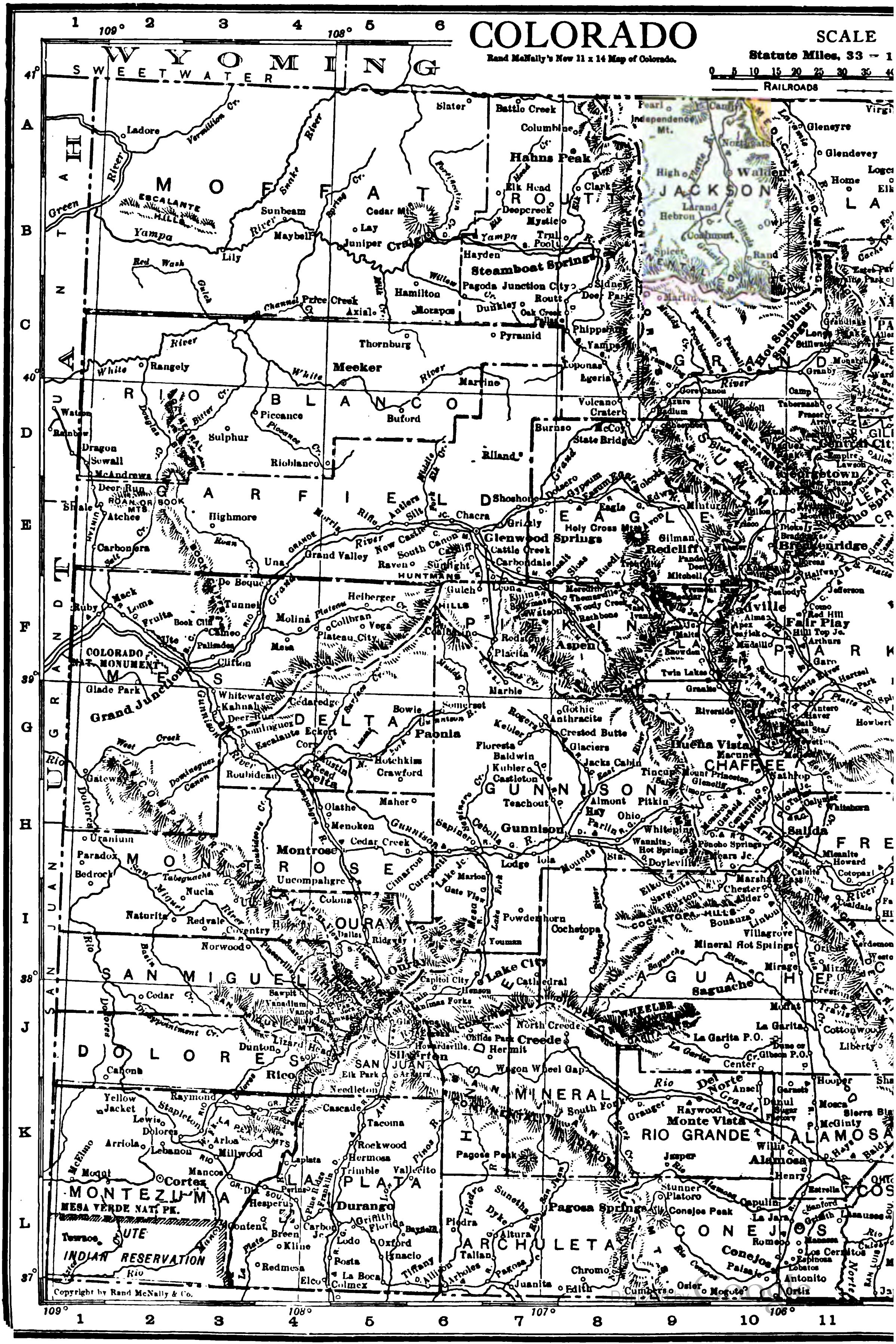
Estimated population, 962,060

COUNTIES

Pop.	County	Key
8,892	Adams	D 15
......	Alamosa (Pop. included in Conejos County)	K 11
10,263	Arapahoe	E 15
3,302	Archuleta	L 7
2,516	Baca	L 21
5,043	Bent	J 18
30,330	Boulder	C 12
7,622	Chaffee	G 10
3,687	Cheyenne	G 21
5,001	Clear Creek	E 12
11,285	Conejos	L 10
5,498	Costilla	L 12
.....	Crowley (Pop. incl. in Otero Co.)	I 17
1,947	Custer	I 12
13,688	Delta	G 5
213,381	Denver	E 13
642	Dolores	J 3
3,192	Douglas	F 14
2,985	Eagle	E 8
5,331	Elbert	F 16
43,321	El Paso	G 15
18,181	Fremont	H 12
10,144	Garfield	E 4
4,131	Gilpin	D 12
1,862	Grand	C 10
5,897	Gunnison	H 7
646	Hinsdale	J 6
13,320	Huerfano	K 14
1,013	Jackson	B 9
14,231	Jefferson	E 13
2,899	Kiowa	H 20
7,483	Kit Carson	F 21
10,600	Lake	F 9
10,812	La Plata	L 5
25,270	Larimer	B 12
33,643	Las Animas	L 17
5,917	Lincoln	G 18
9,549	Logan	A 19
22,197	Mesa	F 2
1,239	Mineral	K 7
.....	Moffat (Pop. incl. in Routt Co.)	B 4
5,029	Montezuma	L 2
10,291	Montrose	H 3
9,577	Morgan	C 17
20,201	Otero	J 18
3,514	Ouray	I 5
2,492	Park	F 11
3,179	Phillips	B 21
4,566	Pitkin	F 7
9,520	Prowers	J 22
52,223	Pueblo	J 15
2,332	Rio Blanco	D 4
6,563	Rio Grande	K 9
7,561	Routt	B 7
4,160	Saguache	J 9
3,063	San Juan	J 5
4,700	San Miguel	I 3
3,061	Sedgwick	A 21
2,003	Summit	E 10
14,351	Teller	G 13
6,002	Washington	D 19
39,177	Weld	B 16
8,499	Yuma	D 21

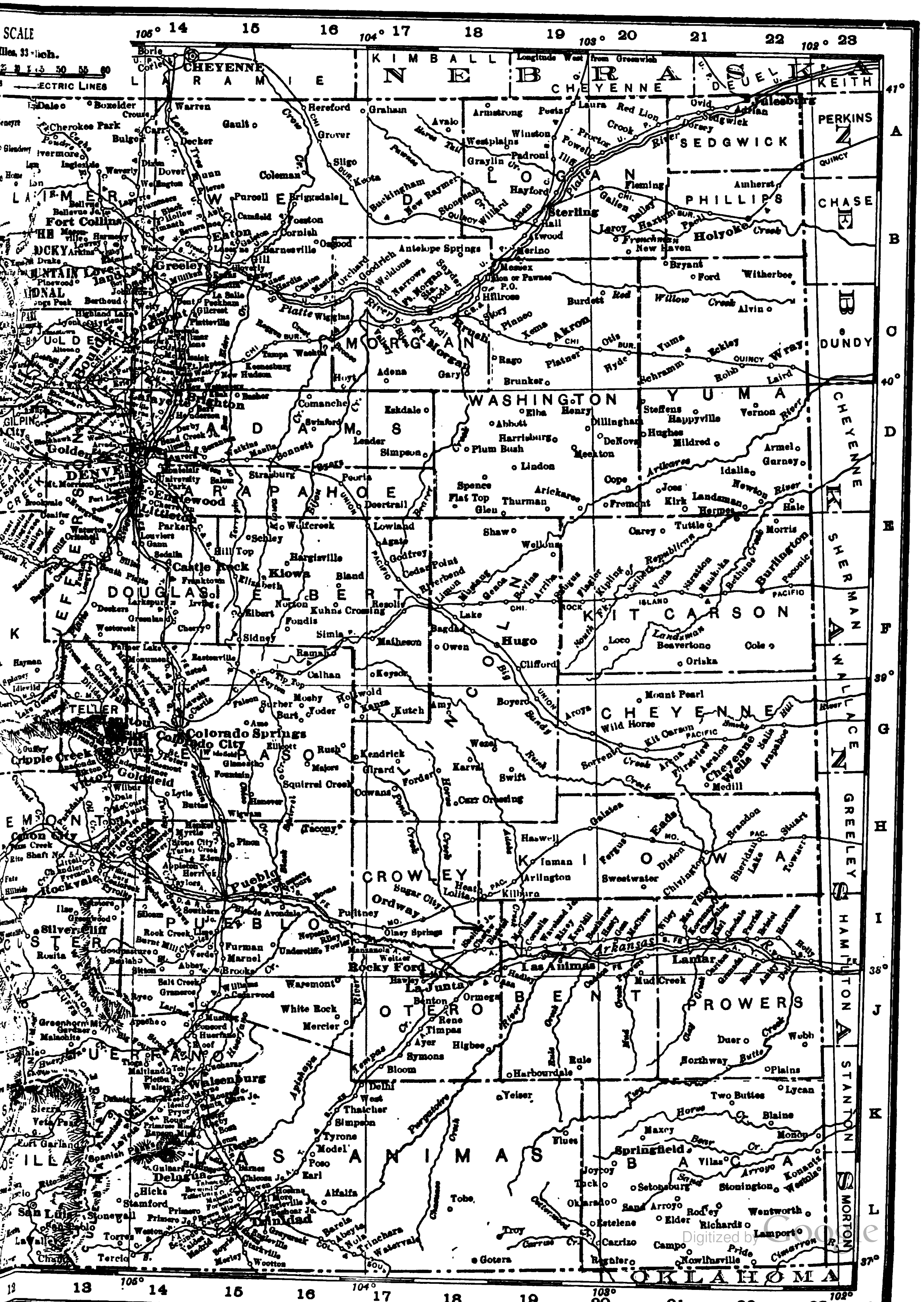
Incorporated Cities, Towns, and Villages

Pop.	Place	Key
858	Aguilar	K 15
647	Akron	C 19
3,013	Alamosa	K 11
301	Alma	F 10
145	Altman, Teller	G 13
164	Anaconda	G 13
200	Animas	J 5
681	Antonito	L 10
26	Arrow, Grand	D 11
840	Arvada	D 13
1,834	Aspen	F 8
569	Ault	B 14
679	Aurora	D 14
235	Basalt	E 7
227	Bayfield	L 5
104	Bellvue	B 13
758	Berthoud	C 13
668	Black Hawk	D 12
96	Bonanza	I 10
11,669	Boulder	C 13
834	Breckenridge	E 10
850	Brighton	D 14
997	Brush	C 18
1,041	Buena Vista	G 10
368	Burlington	F 22
146	Cameron, Teller	G 13
5,162	Canon City	H 13
284	Carbondale	E 6
365	Castle Rock	E 14
295	Cedaredge	G 5
385	Center	L 10
1,728	Central City	D 12
270	Cheyenne Wells	G 22
676	Coal Creek	I 13
156	Collbran	F 5
4,333	Colorado City	G 14
32,971	Colorado Springs	G 14
411	Como	F 11
565	Cortez	K 2
392	Craig	B 6
741	Creede	J 7
904	Crested Butte	G 7
231	Creston	J 11
6,206	Cripple Creek	G 13
180	Dacona	C 14
149	De Beque	E 4
958	Delagua	L 15
840	Del Norte	R 9
2,388	Delta	G 4
260,800	Denver	D 14
134	Dillon	E 10
320	Dolores	R 2
4,686	Durango	L 4
186	Eagle	E 8
1,157	Eaton	B 14
712	Edgewater	D 13
293	Edith	L 8
81	Eldora	D 12
194	Elizabeth	E 15
179	Empire	D 11
2,983	Englewood	E 14
596	Erie	C 13
87	Eureka	J 6
600	Evans	B 14
265	Fairplay	F 11
110	Firestone, Weld	B 16
2,712	Florence	H 13
268	Florissant	G 13
11,451	Fort Collins	B 13
614	Fort Lupton	C 14
2,800	Fort Morgan	C 14
431	Fountain	G 15
925	Fowler, Otero	J 18
266	Frederick, Weld	C 14
42	Freshwater, Park	F 11
81	Frisco	E 10
881	Fruita	F 2
950	Georgetown	D 11
33	Gillett	G 13
2,019	Glenwood Springs	E 6
2,477	Golden	D 13
1,112	Goldfield	G 13
359	Granada	J 22
40	Granby	C 11
7,754	Grand Junction	F 3
268	Grand Valley	E 4
576	Gray Creek	L 16
11,420	Greeley	B 14
30	Green Mountain Falls, El Paso	G 15
158	Guadalupe, Conejos	L 10
1,026	Gunnison	H 8
693	Hastings, Las Animas	L 15
341	Haxtun	B 21
314	Hayden	C 7
724	Holly	I 23
659	Holyoke	B 22
131	Hooper, Costilla	L 12
600	Hotchkiss	G 5
343	Hugo	F 18
2,154	Idaho Springs	D 12
48	Ironton	J 5
157	Jamestown	C 12
198	Johnstown	C 14
962	Julesburg	A 22
304	Kersey	B 15
183	Kokomo	E 10
141	Kremmling	C 9
1,892	Lafayette	C 13
448	La Jara	L 11
4,154	La Junta	J 18
405	Lake City	I 7
103	Lakeside, Jefferson	E 13
2,977	Lamar	I 21
2,008	Las Animas	I 19
691	La Veta	K 15
62	Lawrence, Teller	G 13
7,508	Leadville	F 9
534	Limon	F 18
1,373	Littleton	E 13
4,256	Longmont	C 13
1,706	Louisville	C 13
3,651	Loveland	B 13
632	Lyons	C 13
788	Manassa	L 11
567	Mancos	L 13
1,357	Manitou	G 14
428	Manzanola	I 17
782	Marble	F 7
114	Mead, Weld	C 14
807	Meeker	C 5
241	Minturn	D 9
2,544	Monte Vista	K 10
134	Montezuma	E 11
3,254	Montrose	H 4
149	Monument	F 14
251	Morrison, Jefferson	E 13
390	Mountain View, Jefferson	E 13
446	Nederland	D 12
367	Nevadaville, Gilpin	D 12
493	Newcastle	E 5
122	North Creede	J 8
260	North Longmont, Boulder	C 12
212	Norwood	I 3
143	Nunn	A 14
222	Oak Creek	C 7
153	Ohio City	G 8
458	Olathe	H 4
124	Ophir	J 5
705	Ordway	I 18
1,644	Ouray	I 5
669	Pagosa Springs	L 7
900	Palisade	F 3
163	Palmer	F 14
1007	Paonia	G 5
250	Pitkin	H 9
430	Platteville	C 14
43	Poncho Springs	H 10
157	Prospect Heights, Fremont	H 12
54,462	Pueblo	J 15
383	Red Cliff	E 9
26	Red Mountain, Ouray	I 5
368	Rico	J 4
376	Ridgway	I 5
698	Rifle	E 5
78	Robinson, Summit	E 10
1,413	Rockvale	H 12
3,230	Rocky Ford	I 18
42	Rosita	I 13
620	Saguache	I 10
46	St. Elmo	G 9
4,425	Salida	H 10
261	San Rafael, Conejos	L 10
564	Sanford	L 11
121	Saw Pit, San Miguel	J 5
498	Sheridan, Lake	H 22
250	Silver Cliff	I 2
460	Silver Plume	D 11
2,153	Silverton	J 5
1,321	South Canon	E 6
1,227	Steamboat Springs	B 8
3,044	Sterling	B 19
808	Sugar City	I 18
182	Sulphur Springs	D 3
349	Superior, Boulder	C 12
310	Swink	I 18
1,756	Telluride	J 5
13,875	Trinidad	L 15
3,162	Victor	G 13
162	Walden	A 10
2,423	Walsenburg	K 14
129	Ward	C 12
459	Wellington	A 14
232	Westcliffe, Custer	I 12
34	West Creek	F 13
197	Wiley	I 21
556	Williamsburg, Fremont	H 13
935	Windsor	A 19
163	Woodland Park	G 13
1,000	Wray	C 22
332	Yampa	C 8
333	Yuma	D 22



COLORADO

Rand McNally's New 11 x 14 Map of Colorado.


SCALE
ELECTRIC LINES
105° 14 15 16 104° 17 18 19 103° 20 21 22 102° 23
Longitude West from Greenwich
KIMBALL
NEBRASKA
CHEYENNE
DEUEL
KEITH
PERKINS
CHASE
DUNDY
LARAMIE
CHEYENNE
A B C D E F G H I J K L
41° 40° 39° 38° 37°
LARIMER
WELD
LOGAN
SEDGWICK
PHILLIPS
MORGAN
WASHINGTON
YUMA
ADAMS
ARAPAHOE
BOULDER
GILPIN
JEFFERSON
DOUGLAS
ELBERT
LINCOLN
KIT CARSON
TELLER
EL PASO
CHEYENNE
FREMONT
CROWLEY
KIOWA
CUSTER
PUEBLO
OTERO
BENT
PROWERS
HUERFANO
LAS ANIMAS
BACA
CHEYENNE
SHERMAN
WALLACE
GREELEY
HAMILTON
STANTON
MORTON
KANSAS
OKLAHOMA
Cheyenne
Fort Collins
Greeley
Sterling
Julesburg
Holyoke
Akron
Wray
Fort Morgan
Brush
Denver
Golden
Littleton
Englewood
Castle Rock
Kiowa
Hugo
Burlington
Limon
Colorado Springs
Colorado City
Manitou
Cripple Creek
Victor
Goldfield
Cañon City
Florence
Pueblo
Rocky Ford
La Junta
Las Animas
Lamar
Eads
Cheyenne Wells
Walsenburg
Trinidad
Springfield
Platte River
Republican River
Arikaree River
Big Sandy Creek
Arkansas River
Purgatoire River
Two Butte Creek
Horse Creek
Bear Creek
Cimarron River
UNION PACIFIC
CHI. BUR. & QUINCY
ROCK ISLAND
KANSAS PACIFIC
MO. PAC.
A. T. & S. FE

next greatest, nearly a fifth of the whole, in San Luis Park. There are lines along the South Platte and Arkansas blocks on the Grand in Mesa County, on the Gunnison in Delta and Montrose, and again in Gunnison County; scattered sections on the White and Yampa, along the southern Arkansas tributaries, and indeed in every quarter of the State. In 1910 there were 434 wells used for irrigation purposes, an increase of 59 per cent in 10 years.

Colorado has become a great farming State, producing not only large quantities, but an excellent quality, of the staple products. The production for 1915 is as follows:

	Acreage	Yield per acre, bushels	Production, bushels	Value
Corn......	470,000	24	11,280,000	$6,204,000
Wheat.....	560,000	23.8	13,310,000	10,650,000
Hay.......	970,000	*2.2	*2,134,000	16,218,000
Oats.......	300,000	39	11,700,000	4,797,000
Potatoes...	53,000	135	7,155,000	3,935,000
Rye.......	30,000	18	525,000	368,000
Barley.....	130,000	36	4,680,000	2,246,000
Sugar beets.	172,000	*11	*2,008,118	11,818,000

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*Tons.

The largest individual product of the irrigated farm is the sugar beet. There were 15 factories operated during 1916, with a substantial increase in 1917. Over $25,000,000 are invested in these factories.

Orchard, small fruits and grapes amounting to $5,078,654 were marketed in 1909. Most of the fruit-raising is in Delta, Mesa and Montrose counties, on the Grand and Gunnison, in Boulder County, on the South Platte, and in Fremont County, on the upper Arkansas. A valuable crop on the Arkansas is that of muskmelons, including the famed Rocky Ford cantaloupes.

Stock raising has increased with the production of feed, or vice-versa. The livestock industry of Colorado is characterized by a marked increase during the last decade. In 1915 there were 296,368 horses valued at $20,031,314; 23,284 mules valued at $1,999,800; 1,332,479 ranch cattle valued at $38,230,231; 101,037 dairy cattle valued at $5,786,281; 1,823,491 sheep valued at $4,573,120. All other animals were valued at more than $2,000,000. This was full valuation for the purpose of taxation. The number and value of all kinds of stock have had a remarkable increase, yet the quality has improved more rapidly than the quantity. Many of the stockmen have devoted much time and attention to improving the quality of their stock. Dairy and poultry products are in great demand. In 1910 there were 69 butter, cheese and condensed milk establishments.

Geology and Mining.— The main ranges, particularly the east range, have a core of schist and gneiss with an occasional area of granite. These main ranges are flanked on all sides with sedimentary rocks. In many cases, these rocks show practically all the geological epochs from Cambrian Quartzite to the Quaternary, while again the most recent is found resting on the most ancient. There are large areas of purely eruptive rock, such as the San Juan Range in the southwest and the Spanish Peaks, near Walsenburg. The prairie land is so completely clothed with soil that it is difficult to follow the geological skeleton, but it is probable that nearly all geological periods are represented in its formation. Great coal deposits are found in the upper Cretaceous, and most of the metallic deposits are found in igneous formations.

Colorado leads the Western States in mineral production. Total output (1903) $65,284,009; (1904) $68,870,280; (1905) $89,309,861; (1909) $59,189,974. The output (1909) from the State's mineral resources was as follows: gold, $21,846,600; silver, $4,600,100; lead, $2,522,036; zinc, $2,173,068; copper, $1,493,132; clay products, $2,049,024.

In 1915 there were some striking changes in the value of metals mined: gold, $22,425,518; silver, $3,517,972; lead, $3,223,583; copper, $1,233,405; zinc, $13,660,040; tungsten, $5,000,000. The production of zinc worth $6,000,000 in 1906 and more than $13,000,000 in 1916 places Colorado as the fourth State in the production of this metal. Boulder County is noted for its tungsten. Colorado's production of the precious and semi-precious metals in 1916 reached a total value of $49,200,675, an increase of 13 per cent over the figures of 1915. This mineral wealth was secured from 2,699,243 tons of ore raised from 825 deep mines, and from 27 placer workings. Lake County, which includes Leadville and the surrounding districts, held its former record of a much larger yield than any other portion of the State, with the single exception of gold, in which it was surpassed by Teller County, which includes the famous Cripple Creek district.

The total yield was distributed as follows: gold (39 per cent), 926,506 fine ounces, valued at $19,153,821; zinc (37 per cent), 134,285,463 pounds, $17,994,252; silver (10 per cent), 7,656,544 fine ounces, $5,038,006; lead (9 per cent), 70,914,087 pounds, $4,893,072; copper (4 per cent), 8,624,081 pounds, $2,121,524. Nearly the entire output was smelted in the 10 smelting plants of the State, and these plants also handled a considerable quantity of ore from Idaho, South Dakota, Oklahoma and Kentucky and from Canada also.

Iron sulphides are mined at Creede and other places from which sulphur is obtained in paying quantities. Uranium and vanadium are found in large quantities. There is a vast quantity of oil shales in the northwest. The output of silver is steadily increasing. About three-fourths of the silver is from lead ores, and Colorado's lead product is one-sixth of that of the whole country. Lead is not only sold as a raw material, but is a most valuable flux for smelting gold and silver ores, therefore large quantities are imported from other states. The mines of Cripple Creek and Leadville are among the best equipped in the country. Cripple Creek is the leading gold-producing section in the State and Leadville leads in the production of silver, lead, copper and zinc.

As a coal-producing State Colorado ranks ninth. Its greatest production was in 1910 when 12,104,887 tons were mined. The normal production averages 10,000,000 tons per year, about one-half coming from Las Animas County in the central part of the State.

Marble, fuller's earth, potter's clay, fire clay, cement shales (the finest in the world), limestone and abrasives, petroleum and natural gas are valuable and abundant minerals. The Florence oil fields produce the finest oils in the world.

Manufactures.— The chief industries of

Colorado could be predicted from a glance at its raw materials — precious metals, copper and lead, coal and iron, wood, cattle and grain. These mean smelting, iron and steel and railroad work, lumber manufacture, meat-packing, flouring-mills and breweries. In 1909 there were 2,034 manufacturing establishments in the State; in 1916 there were 2,350; the capital invested amounted to $162,668,000; there were 28,067 wage earners, whose wages aggregated $25,560,000; the cost of materials used was $80,491,000; and the value of the products was $130,044,000. The latest information, for the year 1916, on manufactures in Colorado places the number of manufacturing establishments at 2,350 and laborers engaged in manufacturing 35,000, capital invested $189,000,000, the value of the product produced $150,000,000 and amount paid for labor and salaries $30,350,000, and the material used cost $95,000,000. The prospect for manufacturers in Colorado, particularly in Denver, is better than ever before in the history of the State.

Railroads.— Colorado has about 5,814 miles of main track of steam roads valued for purposes of taxation at $179,460,890; besides well-developed electric systems, not only in cities, but between mining camps. A number of great trunk lines cross the State; while short lines pierce to the heart of its mountain districts, giving the best transportation service of any State along the Rocky Mountains. The chief systems are the Union Pacific, the Missouri Pacific, the Atchison, Topeka and Santa Fé, the Denver and Rio Grande, the Rock Island, the Colorado and Southern, the Colorado Midland, the Rio Grande Western, the Burlington, the Denver and Northwestern (the Moffat Railroad). Within the past few years two important branch lines have been built from Denver, connecting with the Burlington and the Northwestern systems.

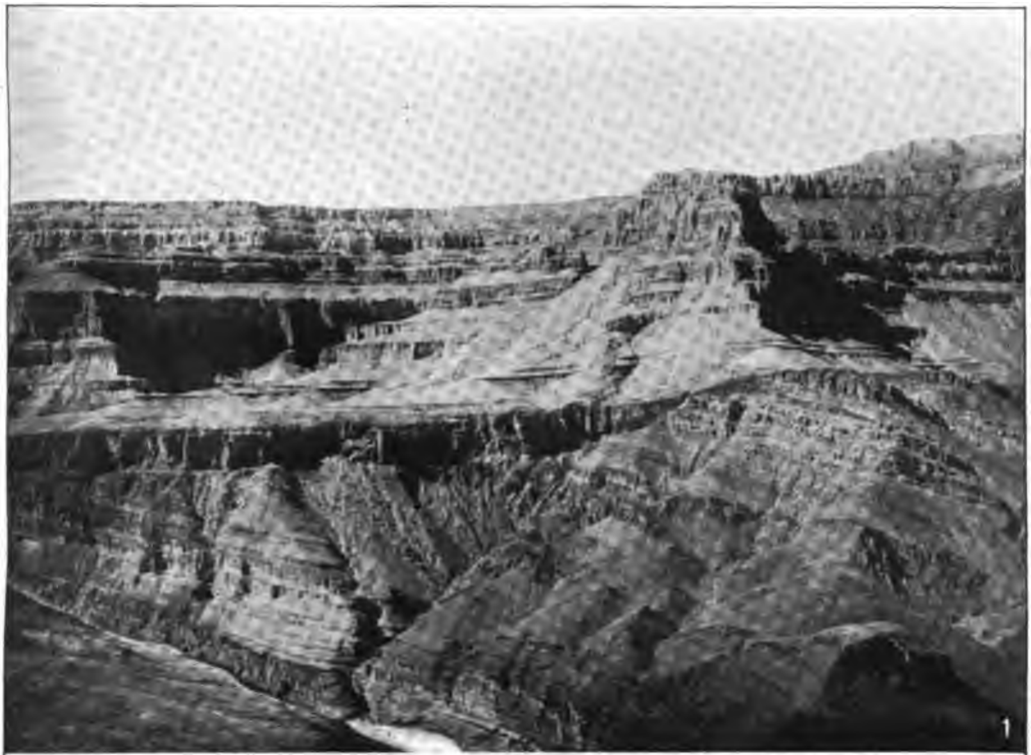
Finances.— In 1908 the assessed valuation was $1,250,807,000, and the gross floating and bonded debt in 1916 was $4,020,607.66. Assets, taxes due and sinking fund, $2,623,318.34, net debt, $1,397,289.32. There were in Colorado, 1 Nov. 1916, 121 National banks, 196 State banks and trust companies, 5 savings banks and 31 private banks, with a combined capital of $20,013,000 and a total deposit of $187,471,000, an increase of 35 per cent in capital and 50 per cent in deposits since 1907.

Churches.— There are about 700 churches and 1,000 Sunday schools in the State. The Methodists, Presbyterians, Roman Catholics, Baptists, Congregationalists and Disciples of Christ are the strongest denominations, while the Episcopalians, Lutherans and other denominations have many churches throughout the State. The various denominations are very aggressive both in spiritual and secular affairs. The Jews are a very important element in the growth and development of the State; they number not less than 10,000.

Education.— The organization of the school system, the efficiency of teachers and the equipment of schoolhouses, places Colorado with the States that lead in educational affairs. In 1916 there were 267,241 children of school age. Of these 178,811 were enrolled in the public schools, while many were in private schools. There are 2,963 schoolhouses and 6,082 schoolrooms in the State with a valuation of $11,220,853, for the support of which a tax of $8,176,856 was collected. Teachers' salaries amount to $4,402,242. The total expenditure for all purposes was $7,110,987. The institutions of higher learning are the University of Denver (1864, M.E.), the pioneer institution of higher learning in the Rocky Mountains, with (1916) 225 professors and instructors, 1,456 students, 3,163 graduates; Colorado College (1874, Congregational), 48 professors and instructors, 710 students, 940 graduates; University of Colorado (1877, State), 200 professors and instructors, 2,009 students, 2,861 graduates; College of Sacred Heart (transferred from Las Vegas, N. M., in 1884, Jesuit). The State supports the School of Mines at Golden, ranking among the best in the world, and the State Teachers College at Greeley, with 63 teachers, 644 students above the Training School, and 1,200 students in the summer school and 2,000 graduates. An aggressive growing State Normal School is maintained at Gunnison. The College of Agriculture and Mechanic Arts at Fort Collins has a large student body doing excellent work. Its experiment station has attracted the attention of the world by its cross-breeding of animals and plants. The University of Colorado maintains a medical school. There are many private schools in Denver, Boulder, Cañon City, Leadville and other cities of the State. In Denver the Baptists maintain the only women's college (Colorado Women's College) in the Rocky Mountains. The Westminster University of Denver (Presbyterian) is in the process of organization.

Charitable and Penal Institutions.— The State maintains an asylum at Pueblo, a State prison at Cañon City and a reformatory in Buena Vista, all under the control of the Board of Corrections, consisting of three members. There is a Soldiers' and Sailors' Home at Monte Vista. The counties and cities have organizations for the care of the poor. The prisoners in the State Prison and Reformatory are employed in purely institutional labor on the inside and in roadmaking and farming on the outside. The indeterminate sentence with maximum and minimum periods is used. An Industrial School for male juvenile offenders at Golden, where the inmates are not confined or marked with penal badges, and an Industrial School for girls at Morrison are among the best institutions of the kind in the world.

State Government.—The State constitution, which was largely modeled after that of Illinois, was ratified 1 July 1876. Colorado was admitted to the Union by proclamation of the President 1 Aug. 1876. A few important amendments have been made to the constitution. The most important are the one that provides optional home rule for certain cities and the one that gives women the right of suffrage. The suffrage amendment was voted in 1893. The women have full right to hold office. In the State the office of superintendent of public instruction and in many counties the office of county superintendent of schools are conceded to the women. Experience is leading both the women and the men to believe that other positions are successfully filled by the women, even more so than the educational offices, and there is now a tendency to elect women to such offices as county clerk, county treasurer, and even county judge, and the women are asking for



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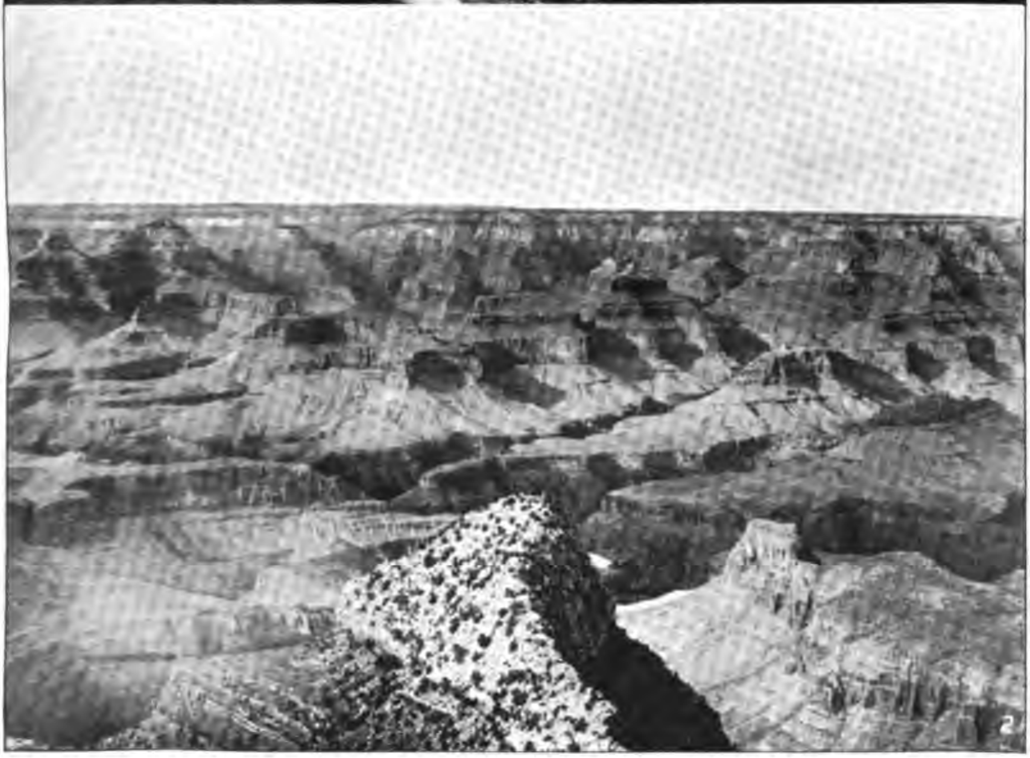
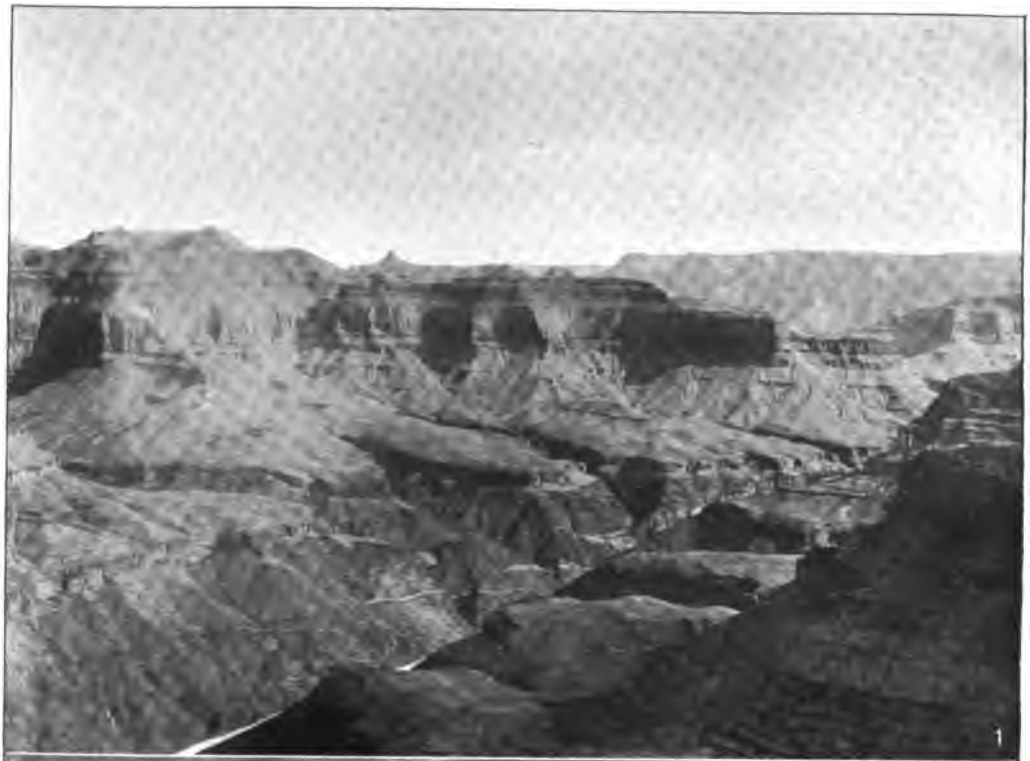
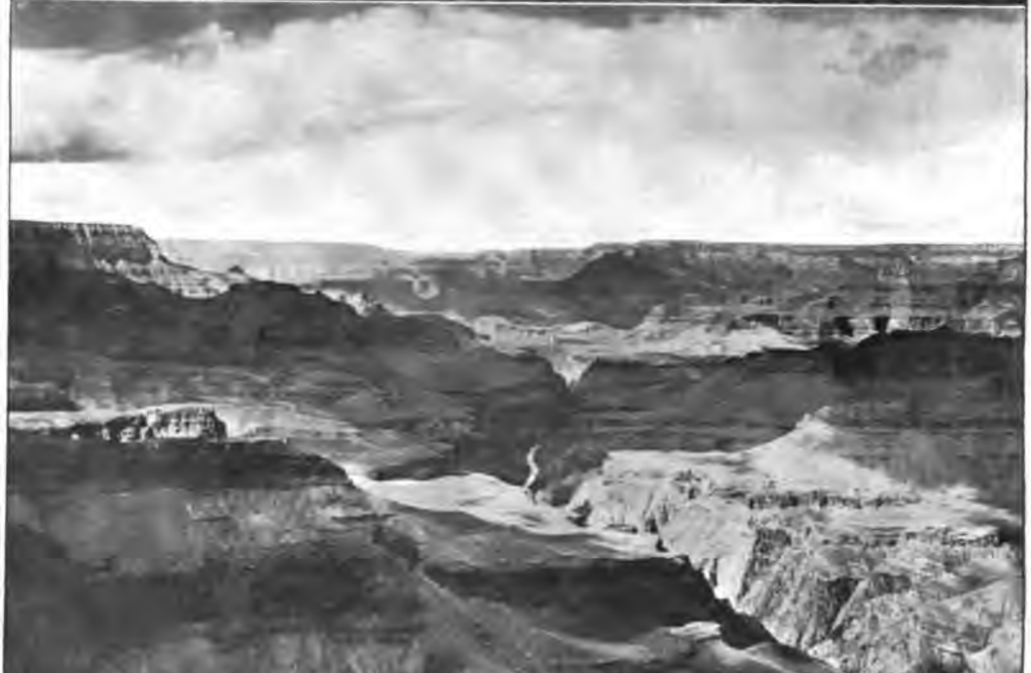


2

GRAND CANYON

1 North wall, showing great wedge of Algonkian rocks
2 Looking north from Grand View to Kaibab Plateau on north rim





GRAND CANYON

1 Looking east from south rim near Bass' Camp. (In the centre is the granite gorge)
2 Looking west from Zuni Point

the office of secretary of State, State auditor, etc.

Executive.— Elective executive officers hold office for two years. The governor (salary $5,000) may veto any bill and specific items in an appropriation bill. In either case the veto may be overruled by a two-thirds vote of each house. Three boards of great importance have been recently organized — The Tax Commission, The State Public Utilities Commission and The Industrial Commission. Each of these boards is composed of three members appointed by the governor and confirmed by the Senate for a period of six years. The salaries of The Tax Commissioners are $3,500 each; of the members of the other boards, $4,000 each. The duties of The Tax Commission are the assessment of corporations, supervision of assessment and the collection of taxes in counties, making the State tax levy, acting on all petitions for abatements, rebates or refunds of taxes. The Industrial Commission has charge of the State Compensation Insurance Fund and it is its duty to inquire into and supervise the enforcement of law as far as respects relations between employer and employee, of the laws relating to child labor, laundries, stores, factory inspection, employment of females, employment offices and bureaus, mining — both coal and metalliferous, fire escapes and means of egress from places of employment and all other laws protecting the life, health and safety of employees, etc. The Public Utilities Commission has supervisory power over all public utilities, whether privately or municipally owned, including automobile lines in competition with railroads. It has power to fix the rates and to pass upon the service rendered.

Legislative.— The general assembly meets biennially; the 35 senators are elected for four years and the 65 representatives are elected for two years. The constitution limits the total membership of the two houses to 100 members.

Judiciary.— The Supreme Court consists of seven members, elected for 10 years. The court is divided into three departments. The chief justice, who is the judge having the shortest term to serve, providing he has been elected for the full term, presides in each department. Constitutional questions must be heard by the full bench, other questions may be. There is no appeal from the decisions of a department. The district judges are elected for six years and the county judges for four years.

Militia.— The National Guard, a part of the militia of the State, consists of one regiment of Infantry, one squadron of Cavalry, one battalion of Field Artillery, one company of Signal Corps, one Hospital Corps, two companies of Engineer Corps. The complete organization contains 1,500 men.

Population and Divisions.— The first (Territorial) census, that of 1860, showed 34,277 people; 1870, 39,864; 1880, 194,327; 1890, 412,198. The census of 1900 showed a population of 539,700; of 1910, 799,024; 1916 (government estimate), 975,190. Of the total population of the State in 1910, 475,136, or 59.5 per cent, are native whites of native parentage, and 181,428, or 22.7 per cent are native whites of foreign or mixed parentage, 126,851 are foreign born whites and 11,453 are negroes. There is very little change in percentages over the census of 1900. Thirty-four and nine-tenths per cent were born in Colorado; foreign born were from Germany, Italy, Russia, Austria, Sweden, England, Canada, Ireland, Scotland, Denmark and Mexico, the largest percentage being from Germany. There are 194,164 foreigners reported.

There are 63 counties in the State, as follows, with their county-seats:

Adams, Brighton.
Alamosa, Alamosa.
Archuleta, Pagosa Springs.
Arapahoe, Littleton.
Baca, Springfield.
Bent, Las Animas.
Boulder, Boulder.
Chaffee, Buena Vista.
Cheyenne, Cheyenne Wells.
Clear Creek, Georgetown.
Conejos, Conejos.
Costilla, San Luis.
Crowley, Ordway.
Custer, Silvercliff.
Delta, Delta.
Denver, Denver.
Dolores, Rico.
Douglas, Castlerock.
Eagle, Redcliff.
Elbert, Kiowa.
El Paso, Colorado Springs.
Fremont, Cañon City.
Garfield, Glenwood Springs.
Gilpin, Central City.
Grand, Sulphur Springs.
Gunnison, Gunnison.
Hinsdale, Lake City.
Huerfano, Walsenburg.
Jackson, Walden.
Jefferson, Golden.
Kiowa, Sheridan Lake.
Kit Carson, Burlington.
Lake, Leadville.
La Plata, Durango.
Larimer, Fort Collins.
Las Animas, Trinidad.
Lincoln, Hugo.
Logan, Sterling.
Mesa, Grand Junction.
Mineral, Creede.
Moffat, Craig.
Montezuma, Cortez.
Montrose, Montrose.
Morgan, Fort Morgan.
Otero, La Junta.
Ouray, Ouray.
Park, Fairplay.
Phillips, Holyoke.
Pitkin, Aspen.
Prowers, Lamar.
Pueblo, Pueblo.
Rio Blanco, Meeker.
Rio Grande, Del Norte.
Routt, Hahns Peak.
Saguache, Saguache.
San Juan, Silverton.
San Miguel, Telluride.
Sedgwick, Julesburg.
Summit, Breckenridge.
Teller, Cripple Creek.
Washington, Akron.
Weld, Greeley.
Yuma, Wray.

In 1900 there were 27 places in Colorado of over 2,000 people; 17 of over 3,000; and 8 of over 4,000. The urban population of the State had so grown by 1916 that 34 incorporated places were over 2,000 in population; 21 over 3,000, and 16 over 4,000. The metropolis is Denver (q.v.), on the east flank of the Rocky Mountains, north of the centre, with 133,869 inhabitants in 1900 and 213,381 in 1910, more than doubling in 20 years; it is the head of the Rocky Mountain trade, and chief United States market for ranching, prospecting, and mountaineering supplies. Pueblo with 44,395, and Colorado Springs with 29,078, are on the same front line of the mountains; the former a mining emporium; the latter the greatest sanatorium of the West. Leadville 7,503, is the head of a great mining district on the upper Arkansas west of South Park; Cripple Creek, 6,206, is the centre of its rich mining region, west of Colorado Springs; Boulder, 9,539, in the mountains northwest of Denver, is a sanatorium with medicinal springs, also a manufacturing town; Trinidad, 10,204, in the extreme south, is the southernmost of the frontal towns, below Pueblo; Greeley, with a population of 8,179, is the chief city of Weld County. Colorado towns are growing so rapidly and have developed so many suburbs that even the figures of the census give a very inadequate idea of their population or importance.

History.— Colorado (Sp., pp. of verb Colorar, to color; colloquially used for red-colored) was named either from the river of that name or from the varied colors of the landscapes. Its territory is composed of three portions: one from the Louisiana Purchase; one from the Texas Cession; and the third from the Mexican Cession of 1848. The southwest portion was, in prehistoric times, inhabited by the Pueblos (the Cliff Dwellers). A few of the followers of De Soto and Coronado seem to have entered the territory of the State about 1541. It was explored in the southwest by Escalante in 1776, and its eastern mountain and plain regions by Zebulon Pike (1806) and Stephen H. Long (1820). Later John C. Fremont, led by Kit Carson, penetrated many portions of the Rocky Mountain region. Gold had been discovered in small quantities many times from 1806 to 1857 but the discoveries of 1858, near the confluence of Cherry Creek with the Platte, brought a large number of prospectors into the State. People from Georgia, Kansas, Missouri and other Eastern States came in large numbers. Prospectors from Kansas and Georgia built Montana on the Platte near where Denver now stands; other towns followed; Auraria, Saint Charles Town (now Denver), Golden, etc.

The discoveries of George A. Jackson at Idaho Springs on the south fork of Clear Creek and by J. H. Gregory on the north fork at Central City brought immigrants by the thousands. At once, local political organizations were made without regard to the territorial government of Kansas, of which Colorado was then a part. It was but a step from making laws for a mining camp to making laws for a whole district, from city building to State building. This step was soon taken. In 1859 delegates met and adopted a constitution for the State of Jefferson with an area somewhat larger than that of Colorado. The opposition to a State led to a second convention which, under the fiction of erecting a territory, established a new State and called it the «Territory of Jefferson.» The constitution adopted by the first convention was ratified but never went into effect. The constitution adopted by the second convention was almost unanimously ratified 24 Oct. 1859, on which day a full complement of State officers was elected. R. W. Steele, who was elected governor, continued in office until 1861, when he surrendered his office to William Gilpin, first governor of the Territory of Colorado.

Colorado was anxious for statehood, but it was not until party necessity compelled the majority party of Congress to turn to the West for more senators, that the enabling act was passed. The Constitutional Convention (in session 20 Dec. 1875 — 14 March 1876) provided that the territorial officers should become the State officers and serve until their successors were elected (at the regular election) and qualified.

Politics.— Colorado was admitted as a Republican State, but has since undergone repeated changes in its political faith. It left the Republican ranks on the «money issue,» but the improved methods of handling silver ore made silver smelting more profitable at the later ruling prices than it was in 1896. In recent years the tendency of the State is to be Democratic. Henry A. Buchtel was elected governor on the Republican ticket in 1906. He was succeeded by John Shafroth, now United States senator, in 1909. Elias A. Ammons, Democrat, became governor in 1913. He was succeeded by George A. Carlson, a Republican, in 1915. Julius C. Gunther, a Democrat, became governor in 1917. In the history of the State there have been 10 Republican governors and 10 Democratic governors, six of whom were born in Ohio.

The following is a complete list of governors:

TERRITORIAL GOVERNORS

William Gilpin	1861–62
John Evans	1862–65
Alexander Cummings	1865–67
A. C. Hunt	1867–69
Edward M. McCook	1869–73
Samuel H. Elbert	1873–74
Edward M. McCook	1874–75
John L. Routt	1875–76

STATE GOVERNORS

John L. Routt	Republican	1876–79
Frederick W. Pitkin	Republican	1879–83
James B. Grant	Democrat	1883–85
Benjamin H. Eaton	Republican	1885–87
Alva Adams	Democrat	1887–89
Job A. Cooper	Republican	1889–91
John L. Routt	Republican	1891–93
Davis H. Waite	Populist and Democrat	1893–95
Albert W. McIntire	Republican	1895–97
Alva Adams	Democrat and Silver Rep.	1897–99
Charles S. Thomas	Dem., Pop. and Silver Rep.	1899–01
James B. Orman	Dem., Pop. and Silver Rep.	1901–03
James H. Peabody	Republican	1903–05
Alva Adams*	Democrat. Served 10 Jan.–16 March	1905
James H. Peabody	Republican. Served one day	1905
Jesse F. McDonald	Republican	1905–07
Henry A. Buchtel	Republican	1907–09
John H. Shafroth	Democrat	1909–11
Elias M. Ammons	Democrat	1913–15
George A. Carlson	Republican	1915–17
Julius C. Gunter	Democrat	1917–

Bibliography.— Hubert Howe Bancroft's Works (Vol. XXV); Smiley, 'History of Denver'; Hall, 'History of Colorado.'

FRANK H. H. ROBERTS,
Professor of History, University of Denver; and President of New Mexico Normal University.

COLORADO, Tex., city and county-seat of Mitchell County, 260 miles by rail southwest of Dallas, on the Texas and Pacific Railroad and on the Colorado River. It is a cotton-growing and stock-raising centre. It has cotton gins and salt works and there is a trade in gravel and sand. The city owns the waterworks. Pop. 1,840.

COLORADO, University of, a coeducational institution at Boulder, Colo., supported by the income from a tax levy and by special appropriations made biennially by the legislature. It was incorporated in 1861 by the Territorial legislature; when Colorado became a State in 1876, the constitution provided that the «University at Boulder» should become the State University, thus giving it the advantage of the lands appropriated by the national Congress for such institutions. The University was opened in September 1877, with two departments, the normal and the preparatory. In 1878 a College of Liberal Arts was established. The normal and preparatory departments have been discontinued. In addition to the College of Liberal Arts the University now comprises the following: Colleges of commerce, education, engineering and pharmacy, the schools of social and home service, medicine, law, and the graduate school, the training school for nurses, summer session and the university extension division. In 1915–16 there were 1,413 students enrolled in the regular academic

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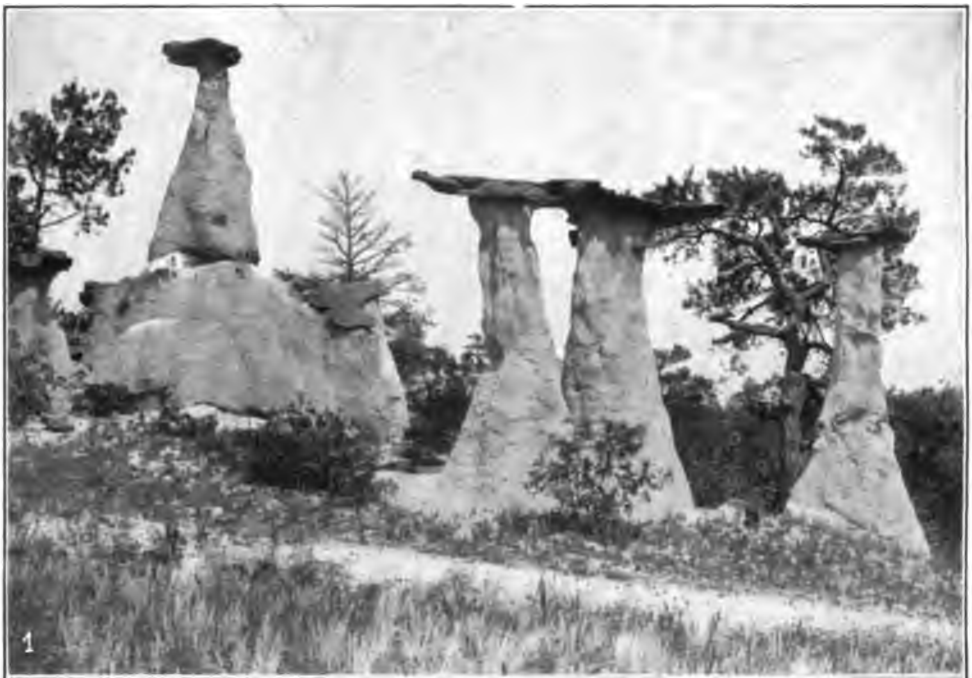
* In 1904 Alva Adams and James H. Peabody were candidates for governor. The Executive Department, entrusted with the canvassing of the vote, gave the certificate of election to Alva Adams and he was inaugurated governor 10 Jan. 1905. James H. Peabody filed a contest before the legislature which decided the contest in favor of Peabody, who became governor 16 March. He resigned and on 17 March Jesse F. McDonald succeeded him as governor.

COLORADO

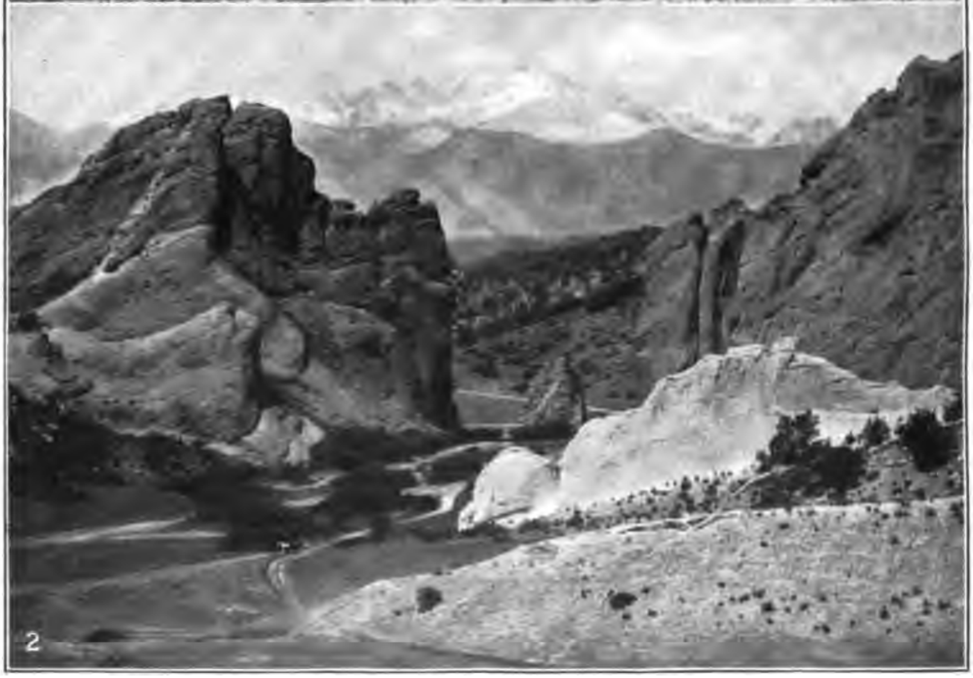
1 A Vista of Mount Sopris, near Carbondale, Colorado, on the Denver and Rio Grande Railroad, altitude 12,823 feet

2 Needle Mountains from Animas Canon, Colorado, on the Denver and Rio Grande Railroad, altitude 13,000 to 14,000 feet

COLORADO SCENERY



1 The Dutch Wedding, in Mountain Park



2 Pike's Peak, from the Garden of the Gods

department, 697 in the summer session and 445 in correspondence and study classes of the extension division, a total, excluding duplications, of 2,453. The library numbers 96,701 bound volumes, 25,000 pamphlets and 1,800 maps.

COLORADO AGRICULTURAL COLLEGE, a coeducational institution at Fort Collins, Colo., providing instruction in agriculture, mechanical engineering, veterinary science, etc., a four years' course leading to the degree of B.S. Its gross income is about $210,000. It includes a school of veterinary medicine, requiring four years to gain the degree of D.V.S. The library contains about 55,000 volumes. The attendance is about 650 in collegiate grade. It also conducts a school of agriculture of secondary grade with an attendance of 370, and a conservatory of music with an attendance of over 100. The activities of the college are divided into education, research and extension. It was opened in 1879, and received a grant of 90,000 acres of land under the act of Congress of 1862. In 1916 there were 89 instructors and over 1,100 students in all departments.

COLORADO CITY, Colo., city in El Paso County, 75 miles south of Denver, on the Denver and Rio Grande and the Colorado Midland railways. The city has a Carnegie library, railroad repair shops, gold-reduction works and an iron foundry. In 1913 the commission form of government was adopted. Pop. 4,333.

COLORADO COLLEGE, a coeducational non-sectarian institution in Colorado Springs, organized in 1874. It offers full collegiate courses and confers the degrees of A.B. and B.S. The college has departments of engineering, forestry and of business administration and banking. It has 14 large stone buildings, costing $1,000,000 with their equipment. The library contains 70,000 volumes and 40,000 pamphlets. The endowment of the college is $1,040,000. In 1916 it had 710 students and 56 instructors. It has a system of exchange instructors with Harvard University.

COLORADO DESERT. See Desert.

COLORADO PLATEAU, an extensive plateau region lying west of the southern Rocky Mountains, and east of the southern Pacific Ranges. It includes parts of the States of Utah, Colorado, Arizona and New Mexico. The plateau consists chiefly of Paleozoic and Mesozoic rocks with some Tertiary gravel and lava flows. The rocks are nearly flat lying, but are cut by great north and south faults, of which the best known are the Hurricane and Grand Wash. These faults, together with the Vermilion and other cliffs, divide the plateau into several separate units of differing elevations, varying from 6,000 to 10,000 feet above sea level. These are trenched by the Grand Canyon and its tributaries. The lower parts of the area are desert, the higher parts rather well forested. The plateau has little mineral wealth and is sparsely populated.

COLORADO RIVER, one of the chief streams of Texas. Rising in the high tablelands of Bexar, near the line of New Mexico, about lat. 32° 30′ N. and long. 102° W., it flows southeast, receiving in its upper course the Conca, the San Saba and the Lano on the south, and the Pecan from the north, and empties into Matagorda Bay. Austin, Bastrop and Columbus are on its banks, and Matagorda near its mouth. For most of its course it flows through a fertile region, and has an average width of 250 feet. It is a clear stream; its name, meaning red, was originally applied to the Brazos, north and east, but the two were interchanged. The Colorado is some 900 miles long, and navigable to Austin or farther.

COLORADO RIVER, or COLORADO OF THE WEST, a great river of the United States and Mexico, formed at about lat. 38° N. and long. 110° W., by the junction of the Green and Grand rivers. The Green River rises in the Rocky Mountains in the west of Wyoming, receiving in its southwestern course the waters of the Bear, the White, the Uintah and San Rafael. From Flaming Gorge, a point in the northwest of Colorado, where the Uintah Mountains rise, the Green River cleaves its way rapidly through canyons, the walls of which tower up to a height of nearly 1,500 feet. The Grand River rises in the Rocky Mountains, west of Denver, Colo., receiving in its southwestern course the South Fork or Gunnison, the San Miguel and Dolores. After the junction the Colorado flows southwest through Utah, joined on the east by the San Juan, on the west by the Dirty Devil and Escalante; southwest through the north of Arizona, till its waters are increased by the Colorado Chiquito, or Little Colorado of Arizona. Near the inflow of this tributary is the Marble Canyon, 3,600 feet deep and about one-third the length of the greater canyon below.

From the mouth of the Little Colorado the river bends west and for more than 200 miles flows through the wonderful Grand Canyon. The successive divisions of the canyon are known as the Kaibab section, the Kanab section, the Uinkaret section and the Sheavwitz section. The walls of this water-worn trench are often vertical, or nearly so, for a distance of thousands of feet at a time; sometimes they slope steeply, or constitute magnificent terraces. The cliffs or rock-walls attain a height of from 4,000 to 7,000 feet above the stream. (For heights of particular points, see Canyon). There are frequent whirlpools and waterfalls. Below the canyon the valley opens, and there is much fertile bottom-land on one or both sides of the river. Numerous tributaries pierce the high plateau on either side, the whole presenting a strangely intersected topography. Escaping from the Grand Canyon, the river flows southwest to the borders of Nevada, receiving from the west the Paria, Tapeat, the Kanat (of Arizona) and the Virgen (of Nevada).

Above Callville, Nev., the Colorado, with its tributaries, again bores its way through deep canyons, the sides of which, in some places, present walls of solid rock nearly 7,000 feet high. The plateaus at the top of these rock masses, generally treeless, are again surmounted by terraces 1,000 feet or more high. These lower and higher terraces are both piled with massive ruins, once the walled towns and cities of a race said to be represented by the present Moqui Indians in the northeast of Arizona and the Nahuas of Mexico. Below Callville the river is again shut in by the last of the canyons, the Black Canyon, 25 miles long, and from 1,000 to 1,500 feet high. Shortly after receiving the Virgen, the Colorado takes a southerly course, severing Arizona and Sonora on the east from Nevada, California and Lower California on the west, and receiving on the east Bill Williams' Fork and the Gila. After absorbing the latter the river sweeps round in a westerly direction for 7 or 8 miles, and soon expands to a width of 1,200 feet. Thence it pursues a tortuous course of 180 miles, the last portion being through Mexican territory, to its mouth in the Gulf of California. There is a vast delta or flood plain formed by the waste from rock erosion. From the sources of the Green River the Colorado measures a total length of about 2,000 miles. It is navigable for steamers as far as Callville, 612 miles from its mouth, and can be made so, it is thought, to the foot of the Grand Canyon, 57 miles higher. The first attempt to navigate the upper part of the Colorado was made in 1891. In 1893 the stream was proved navigable for 130 miles between Green River and Cataract Canyon.

The investigation of geologists dispelled the theory once held that the Grand Canyon was a fracture of the earth's crust. It is now clear that a long period of erosion through plateaus successively uplifted has produced this remarkable gorge. At the bottom of the canyon throughout a considerable part of its course the Archæan system is laid bare. The Algonkian beds with their high coloring give brilliancy to that portion of the canyon where they can be traced. The Cambrian beds are found above the Algonkian, but in places rest directly on the Archæan. The thickness of the Cambrian (here known as the Tonto formation) is in places 1,000 feet. The upper part of the cañon walls consists of carboniferous formations (Red Wall formation below, Aubrey limestone and sandstone above). It has been estimated that all the Eocene, Cretaceous, Jurassic and perhaps Triassic beds and the greater part of the Permian were worn away from the plateau region during the period of erosion. The Marble Canyon platform, like that of the Grand Canyon, consists of carboniferous strata with a considerable number of Permian remnants scattered over it.

In 1540 the Colorado was visited by a detachment of Coronado's expedition and another of his exploring parties gave the first description of the Grand Canyon as seen by white men. About the same time Fernando Alarcon ascended the stream in boats for a long distance. Catholic missionaries subsequently traveled through these regions. For about 300 years, nothing more was learned concerning the Colorado. Much light was thrown on the subject by the investigations of Ives in 1858. In 1869 Powell explored the region and made the descent through the whole course of canyons to the mouth of the Rio Virgen, a distance of more than 1,000 miles. Dutton made geological studies of the Grand Canyon in 1875. In 1889 the canyons were explored by a party of engineers sent out to make surveys.

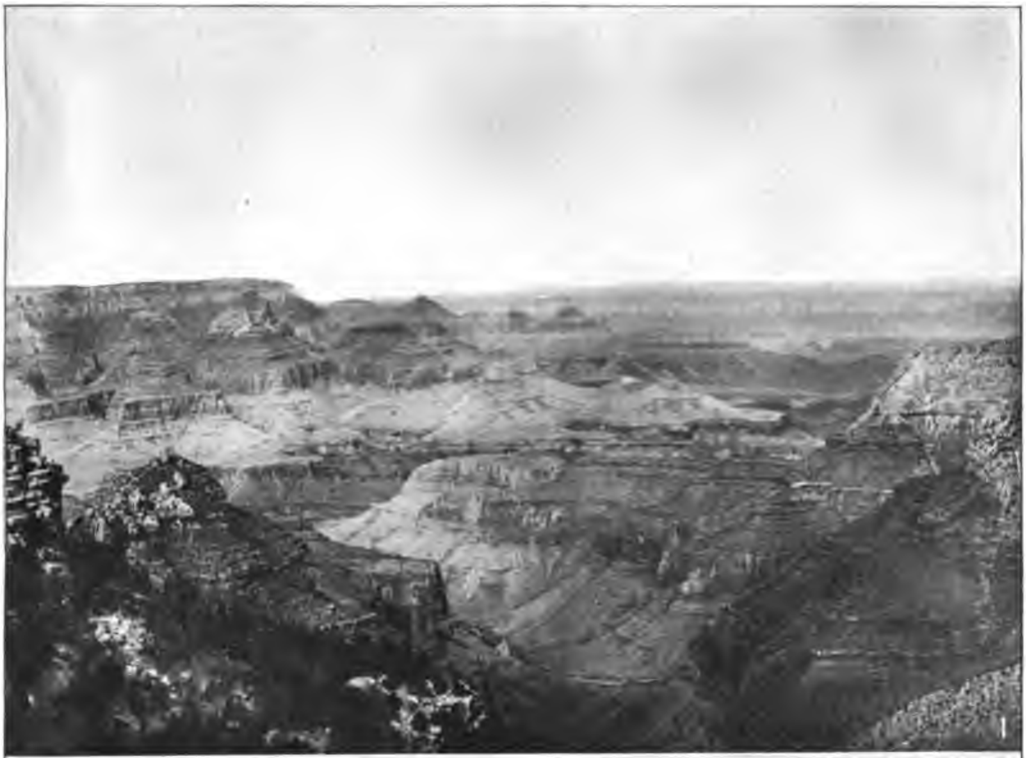
Bibliography.— Powell, ‹Exploration of the Colorado River› (1875); David, W. M., ‹An Expedition to the Grand Cañon of the Colorado›; Dutton, ‹Monograph II, U. S. Geol. Survey› (1882); James, G. W., ‹In and Around the Grand Canyon› (1902); id., ‹The Grand Canyon of Arizona› (1910).

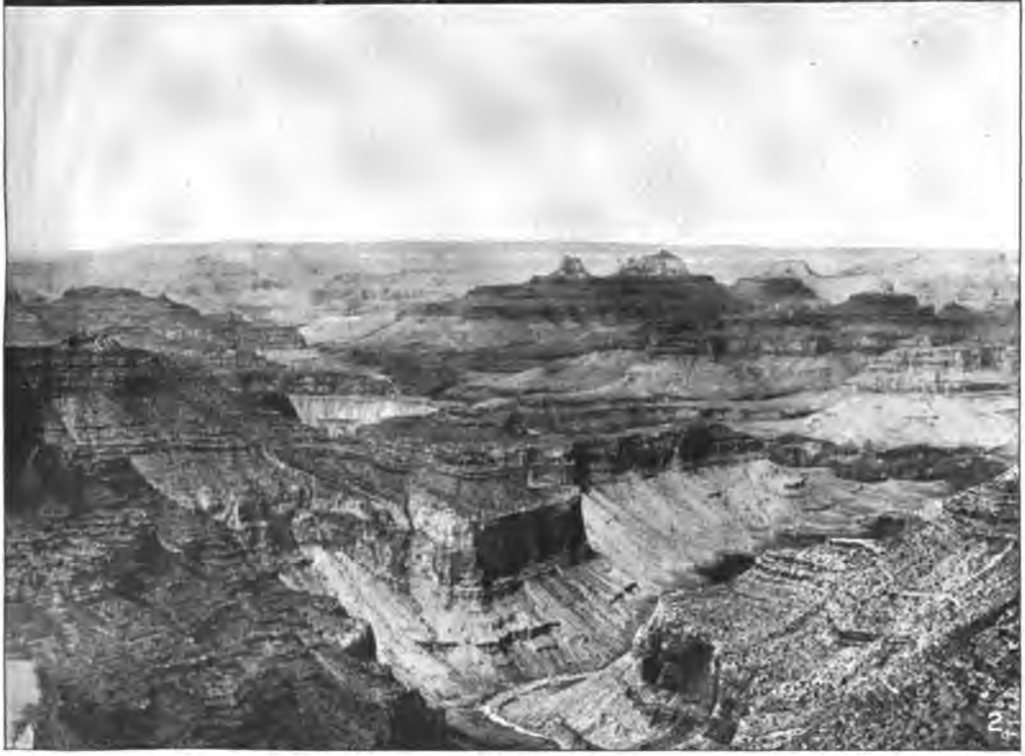
COLORADO SPRINGS, Colo., city and county-seat of El Paso County, on the Denver and Rio Grande, the Denver T. and G., the Santa Fé, Rock Island and Missouri Pacific and the Colorado Mountain railroads. It is situated on a plain at an elevation of 6,000 feet, near Pikes Peak, and has a world-wide reputation as a health and pleasure resort. Colorado Springs is an attractive city and is the midway gate to the western section of the State. The celebrated mineral springs of Manitou attract many visitors. Colorado Springs was settled in 1870 and its wonderful growth since 1892 may be largely attributed to the development of the Cripple Creek gold mines, which are 30 miles distant on the opposite side of Pikes Peak. A great deal of wealth flows into Colorado Springs, whose population has almost doubled in the past 15 years, and whose bank deposits have increased 600 per cent in the same period. The city has a great variety of manufactures, chief among them being pottery and tiles, ore refineries and reduction works. The United States census of manufactures for 1914 records 75 industrial establishments of factory grade, employing 742 persons, of whom 538 were wage earners, receiving annually $401,000 in wages. The capital invested aggregated $2,090,000, and the year's output was valued at $1,908,000: of this, $1,010,000 was the value added by manufacture. The city boasts a handsome opera-house and five clubs, one occupying an edifice worth $80,000, 17 fine school buildings, Colorado College (q.v.), one of the oldest institutions of its kind in the State, with over 500 students, a State institution for the education of the blind and mute, sanatoriums, church edifices, 2 hospitals, and 6 trunk lines, 28 miles of electric railway and a modern telephone system. The city was one of the first to adopt the commission form of government. Colorado Springs has a water supply costing over $3,000,000 and a sewerage system perfected at an expense of $10,000,000. Pop. 32,000.

COLORADO STAGE. The rocks of the Colorado, one of the lower divisions of the upper Cretaceous series, are chiefly of marine origin and cover a great area, having been laid down in an interior sea that stretched from northern New Mexico, where it opened into what was then the Gulf of Mexico, to the Arctic Ocean. This sea at about the latitude of Duluth, Minn., was over 1,000 miles wide. The Colorado is separated into two sub-stages, the lower, or Fort Benton, clays, shales and limestones, and the upper, or Niobrara, shales, sandstones, chalk and chalky marls. The Colorado Stage is of interest because of its marking the time when more of North America was under water than at any other time since the Carboniferous Epoch, and because of the beds of chalk in South Dakota, Kansas, Arkansas, Texas and Mexico. See CHALK; CRETACEOUS SERIES.

COLORATION, Protective. The color of plants and animals is primarily due to the reflection of light, and is dependent in some cases on the pigment in the tissues of flowers, and in the skin, scales, hair or feathers of animals, and in others to structural surfaces which by diffraction give color. Plants are colored green by chlorophyll, so are caterpillars from eating plants. The «chromatic function» is that adaptation of color of the skin of the frog, chameleon, squid, fish or

COLORADO

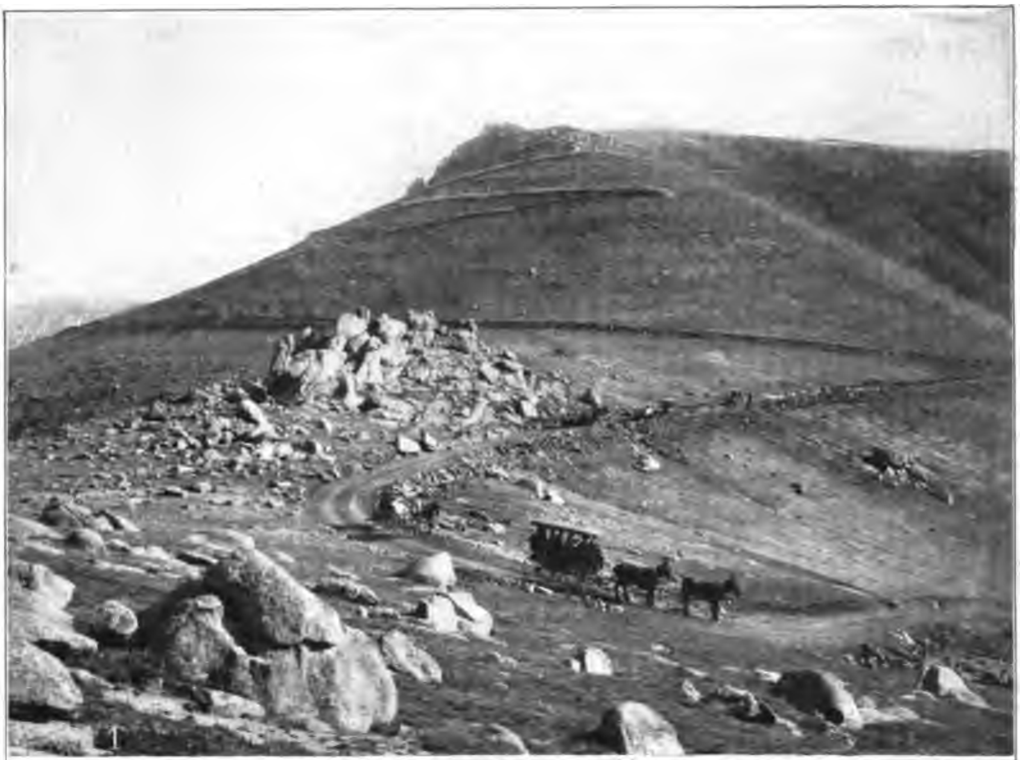


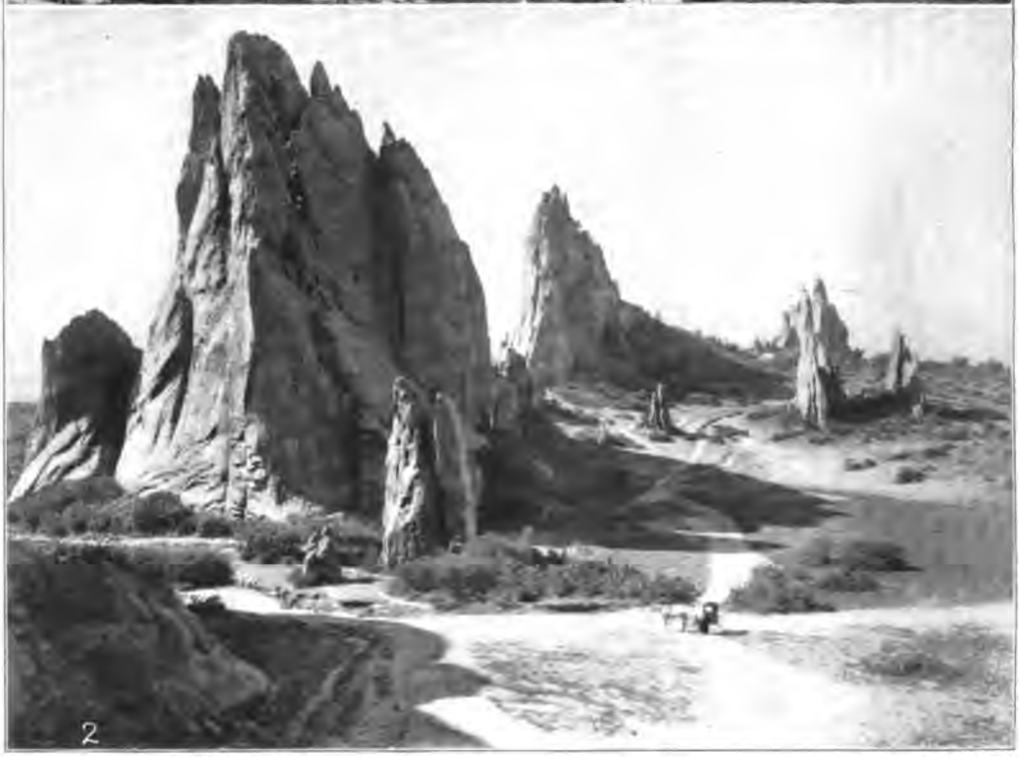


GRAND CANYON

1 Looking east up the river from Zuni Point 2 Looking up from Grand View Point

COLORADO





1 Pike's Peak, Showing Carriage Road

2 Garden of the Gods

crustacean, which rapidly changes so as to simulate the tints of the objects on which they rest. In most animals the coloration is due to pigment-cells (see CHROMATOPHORES), which are more or less ramified, and which, under the stimulus of the prevailing color of the habitat, cause the animal to simulate in hue the ground, or tree, or sea-bottom. In most animals the coloration is permanent, in a few it changes with the change of color of the immediate surroundings of the animal, as in the chameleon. In insects, fishes and birds, where the variety of colors is almost endless, it has been found that even the most striking colors are aids to concealment of the identity of the wearer and thus are its protection.

Pigment in Animals.— That this is primarily due to the action of light is proved by the fact that cave animals, or those living in darkness, are white or bleached out, so that the pigment cells become degenerate, the pigment losing its more or less dark color, while in insects the colors are either optical or natural; the pigments, when present, are formed in the cellular layer of the skin (*hypodermis*). These colors tend to fade after death, but when enclosed and preserved in air-tight sacs, such as the scales and hairs of butterflies, and the wing-covers of beetles, they remain bright for a longer time, though eventually fading when dried specimens are exposed to the light. It has been shown that red, yellow, brown and black colors in the scales of certain butterflies are always due to pigments, while in a few cases greens, blues, violets, purples and whites are due to pigments in the scales themselves. Mayer finds that the pigments of the American silkworm moth (*telea polyphemus*) are derived from the blood of the chrysalis. He has artificially produced several kinds of pigments from the blood, which are similar in color to various markings on the wings of the moth, and has found that chemical reagents have the same effects on their manufactured products as on similar pigments in the wings of the living moth.

Origin of Spots, Bands or Stripes.— The markings of caterpillars, the stripes of the zebra, of many African antelopes and of the tiger are supposed by some writers to be due to the direct effects of light and shade, to shadows cast in jungle-grass or in forests. As proofs of this they instance the experiments of Steinach, who glued strips of black paper to the skins of frogs which were kept in the dark; when they were exposed to the light, only the uncovered parts of their skins returned to a lighter hue, while the covered parts remained dark. The reflected green light in the case of frogs turning green when among leaves is by these writers believed to act directly upon the pigment cells. When the bottom of the vessel is covered with felt or with a wire net, the frogs become black, but recover their green color when a green branch is introduced into the vessel containing them. Again those caterpillars living among pine needles are green, striped with white, yellow and red, exactly harmonizing with the red and yellow or white portions of each cluster of needles; this is ascribed to the direct reflection of different shades of light on the moist skin of the caterpillar. In other caterpillars the longitudinal lines are broken up into spots, and if the process is carried on farther the spotting becomes transverse. Eyelike spots on certain caterpillars have been observed to be gradually formed at successive molts from what were originally continuous lines or stripes. It thus appears that the wonderful variety of colors and markings in animals is primarily due to the direct result of the environment, bringing about different results in animals of different groups and exposed to different environments. An alternative theory which has received widespread acceptance is that built up by Abbott H. Thayer upon his observations covering many years, namely, that color in animals is based upon its ability to conceal them in their usual haunts. Obviously this theory works in excellently with the Darwinian theory of Natural Selection. The individuals whose accidental or inherited colorings most effectively concealed them would be those most certain to escape attack and destruction, and survive as parents to reproduce in their progeny the peculiar colors which proved most protective. In this way, it is argued, the coloring of wild animals has eventually come to reflect the colors prevailing in their native environments. The Thayer theory develops upon a basis of the obliteration of relief by the *shading* of the color from darkest on the upper side, which is best lighted from the sky, to lightest on the under side, which is naturally darkened by the shadow. The result is a flat tint conveying no suggestion of solidity. Upon this primary basis, obliteration of outline is accomplished by (1) a color system which is practically a picturing of the salient features of the background against which the animal is most likely to be seen; and (2) a color scheme which, though striking in tone, by its very boldness baffles recognition of the true form. (The theory is set forth in great detail in the book by G. H. Thayer, noted below). (For coloration due to changes of temperature see *Seasonal Dimorphism* under DIMORPHISM).

General Protective Resemblance.— Cases in illustration are the white animals of the Arctic regions, where extreme cold and dryness have turned the hair of the polar bear and the feathers of the snowy owl white. This applies to species; the individual ptarmigan, ermine, hare, fox, etc., turn white in winter, but of a russet hue in summer, due to the differing light reflected from the ground in summer and the snow in winter. The ptarmigan, grouse, prairie chicken and the like, which build open nests, are protectively colored, while the conspicuously marked kingfisher, parrot, etc., build a nest which conceals the sitting bird.

The under side of the wings of certain butterflies, such as the species of *Polygonia, Suvanessa antiopa* and the East Indian *Vallima,* are assimilated in color, together with their often ragged outlines, to dead and tattered leaves; when the butterfly is resting on the ground or in bushes among the dead leaves, it is difficult to distinguish. On the other hand the upper side of the wings are conspicuously marked with reddish hues and conspicuous bars. In the light of the Thayer theory these markings, although conspicuous, became meaningless bits of color in harmony with the environment, and thus afford practical concealment. Certain moths, when resting on the lichen-covered bark of trees, are wonderfully similar to the surroundings, and are thus protected from the attacks of birds or lizards. In the Arctic regions and in Labrador certain butterflies and moths are of the color of lichen-covered rocks, so much so that when at rest they are difficult to detect.

Special Protective Resemblances.— The most striking examples are the measuring-worms, or geometrid caterpillars, which, when holding themselves out straight and stiff, resemble twigs, not only in shape, but in color and markings; and still more wonderful are those species whose bodies are provided with tubercles which in shape resemble the leaf-bud and other excrescences in the back of the twigs. How to account for the origin of such protuberances is a puzzle. The stick-insect is another example; though not common with us, and supposed to be well protected from the bills of birds, yet in the East Indian Archipelago they are said to be the principal food of one kind of bird. Another example is the famous leaf-insect (*phyllium*) of Java, in which the wings are very broad, thin and marked with veins like the mid-rib and side-ribs of a leaf. Such instances as these are cited as buttresses to the Thayer theory of concealment.

Recognition Marks.— By Waller and others the stripes of the African antelopes, the upturned white tail of the rabbit and hare, and the bars and other conspicuous markings of birds that fly in flocks, are regarded by some as recognition marks, but others consider that this is rather fanciful and that they are protective alone.

Warning Colors.— Certain animals, of which the skunk affords an example, are so marked as to be easily distinguished by their enemies, which, knowing by experience their offensive nature, pass them by. Hence the conspicuous stripes of the different species of these animals in the New World. There are many cases of brightly colored caterpillars which are avoided by birds and lizards which greedily devour green ones. The conspicuous red, blue and purple spots and stripes are advertisement of their inedibility. In Nicaragua, Belt observed that while ducks and fowl fed on ordinary green frogs, a small species gorgeously colored with red and blue was avoided. On offering one to ducks and fowl they all refused to eat it, except one young duck, which took the frog in its mouth, only to drop it, going about jerking its head as if the taste of the frog was nauseous. Although these striking markings are supposed to be the result of natural selection, Eisig's theory that the abundant secretion of pigment is the cause of the distastefulness seems better grounded. Indeed a large number of cases of protective mimicry seem due to the direct action of light and warmth in bringing about the varied hues of the pigment — moreover the range of primary colors is not very great, and the hues are apparently due to the action of the environment, so that we need not, in most cases at least, invoke the somewhat fanciful hypothesis of Wallace, Poulton and others to account for these resemblances. As Eisig claims, the abundant secretion of pigment has caused the insects to be inedible, rather than that the bad taste has caused the production of bright colors as an advertisement or warning signal.

Insects Attracted Rather by the Odors of Flowers than Their Colors.— It has been argued by Lubbock and others that the colors of flowers attract insects, and that the gay lines and stripes leading down to the bottom of deep corollas are guides to the nectar. At present this view has been stoutly opposed by Plateau, after many observations, who thinks that the color of flowers has no connection with the visits of insects, but that they are attracted by the odor of the nectar. He finds that any flower is freely visited if it be nectariferous, no matter how colorless or inconspicuous it may be. Many gay flowers are wholly avoided by insects, but on placing nectar at the base of such flowers insects were at once attracted. It appears from Plateau's observations that color is not a primary factor in attracting insects to flowers. Though bright blossoms are undoubtedly seen by insects from a distance, when they once reach the flowers it is a matter of indifference to them what their color is — blue, red, yellow, green or white — if they differ from one another in no other respect. Consult Beddard, F. E., 'Animal Coloration' (New York 1895); Newbigin, M. I., 'Color in Nature' (London 1898); Poulton, E. B., 'The Colors of Animals' (New York 1890); Thayer, G. H., 'Concealing Coloration in the Animal Kingdom' (New York 1909); Wallace, A. R., 'Natural Selection and Tropical Nature' (New York 1895); also works by Lubbock, Plateau, Coste, Urech, Eimer, Hopkins, Weismann, Tenneck.

COLORIMETER, an instrument for measuring the depth of color in a liquid by comparison with a standard liquid. They are of three general types, based upon the three variables in the intensity of colored solutions: (1) the quantity of coloring matter required to make the match; (2) the volume of the solvent in which it is held; (3) the thickness of the solution through which the light passes before it reaches the observer's eye. These principles are applied (1) when two solutions are brought to agreement in color by the addition of coloring matter; (2) when the match is effected by dilution of one of the two solutions; (3) when the solutions are made to match by changing the thickness through which the light beyond is forced to pass. The form most commonly in use is of the second type. It consists of two long, narrow glass tubes placed side by side on a stand. The standard liquid and the one in question are poured, in equal quantities, one into each tube; and water is then added to the darker till its tint becomes the same as the other. The amount of water used is a measure of the depth of color in the given liquid. The White colorimeter is the principal exponent of the third class. It consists of two hollow wedges of glass placed side by side, and arranged so that one may slide up and down on a bar upon which is marked a scale. The solution to be measured is placed in one of the wedges and the standard solution in the other. Both are viewed through a horizontal slit. The wedge containing the standard is raised or lowered until the color is matched, and the scale is read.

Another type of colorimeter is employed to measure or test the colored light reflected from opaque bodies. The Ives colorimeter is of this type. It consists of a hollow box about 3 by 4 inches and 20 inches long, with a viewing lens at one end, a diffraction grating, and at the farther end lenses and slits which can be adjusted. The field of view is divided by means of a diaphragm so that the light to be tested appears in the upper half while the lower half is lighted by a mixture of red, green and blue-violet rays from the grating. The slits through which the color rays come are opened or closed as the case may require, and the analysis is read on the three color scales. A new (1912) precision colorimeter constructed for the United States Bureau of Standards measures the wave length of the color which is to be tested. The instrument is so arranged that colored rays taken from a spectrum are mixed with white light to match the unknown hue; or, in the case of purples, the rays from the spectrum are mixed with the unknown to make white light. The instrument is operated through the use of a Lummer-Brodhum photometer cube.

COLORING, one of the essential parts of painting — namely, that part which relates to colors. Besides a knowledge of the art of preparing and mixing colors, and the whole mechanical process from the beginning to the finishing of a picture, which in the various kinds of painting varies according to the materials of each, coloring comprehends the knowledge of the laws of light and colors, and all the rules deducible from the observation of their effects in nature, for the use of the artist. This subject has been treated by Leonardo da Vinci in his work on painting; Lomazzo and Gérard Lairesse in books on the same subject; Mengs in his 'Praktischer Unterricht'; Goethe in his 'Farbenlehre'; etc. The skill of the painter presupposes a natural ability founded on superior sensibility — namely, the ability to image forth, and to express with characteristic truth, the peculiar substance and color of any object under the influences of the light and air. With the limited range of pigment colors at his disposal, bounded at one end by the dead white of a piece of white paper, many degrees darker than a sunlit cloud, and at the other end by a flat black many degrees lighter than a piece of black velvet, the artist's work becomes practically a translation from nature, instead of an imitation. For if the colors of nature were reproduced faithfully, her effects would be lost through the limited scale of expression available. The skill of the artist is exhibited in so adapting his translations of local colorings that the effects of nature are virtually reproduced in colors so correct relatively to the other colors of the painting that they are recognized as eminently truthful. To make this translation successful, accurate attention to the relative values of the local tones and tints is requisite. By local tones we understand the natural color of an object as it appears on the spot where it stands, or from the spot where the spectator is supposed to be stationed. In works of art the natural color of an object appears always as a local tone, because every object must be regarded from only one point of view, conformably to which the natural color is modified according to the supposed distance. By tints we understand, in a more restricted sense, the gradations of the clear and obscure which lights and shadows produce on the colored surface. In no object of art do these modifications and shades exist in greater delicacy and diversity than in the human face, which is consequently the most difficult subject for a painter. Coloring, in as far as it is an imitation of the color and character of flesh (the naked body), is called carnation (q.v.). If, in addition to the skilful translation of the natural colors, local tones and tints of its original, the artist also expresses in his work the peculiar character of the substance of which the object consists, the coloring is called true. But to truth should be joined beauty, which is attained by the harmonious union of all the tones of the painting into one dominant tone. The coloring must conform to and promote the object of the painting as a work of art, and by the harmony of the colors and lights, as well as by the truth of the local colors, and of the individual parts of the subject, constitute one beautiful whole. In the choice of lights and the distribution of colors the artist should aim not only at clearness of representation, but at the same time at the production of a pleasing harmony, which should aid the general impression of the work. Consequently harmony and chiaroscuro are comprised in the idea of correct, beautiful coloring. We often see pictures in which the colors are true to nature but which have little merit and are deficient in a harmonious union of excellences.

COLORING MATTERS. This name ought to include every substance, organic or inorganic, which is the cause of color in another, but in practice it is restricted to the natural coloring matters of vegetables and animals, and to the dyes that are used for coloring fabrics. The reason of this restriction probably is that these coloring matters are distinctly different from the tissues or fluids which contain them, whereas the color of a mineral is not in general due to a separable body, but is peculiar to the mineral itself. It is impossible, for instance, to take away the blue color of a copper compound, or the green or yellow of one of chromium. In the mineral world the analogy to the coloring of plants is found rather in rocks; for example, in a sandstone colored with oxide of iron, where the coloring matter may be removed without the rock mass being destroyed.

The organic coloring matters derived from vegetables are both important from their uses in the arts and interesting from their character and decompositions. They may be divided into two classes, those which exist ready formed in the plant, and those which are obtained by the spontaneous or artificial decomposition of some principle in the plant. Of those belonging to the first class, chlorophyll, the green coloring matter of leaves, and the different colors in flowers, are the most obvious. Those however, which are used in the arts are not at first sight apparent, being contained in the seed, bark, stem or roots, from which they can be extracted by water, alcohol, ether, dilute alkalis, etc. The second class includes bodies which result by oxidation or other chemical change from some usually colorless matters, to which the name "chromogens," color-producers, has been given; and, indeed, the question has been raised whether all coloring matters, even in plants, have not been produced from prior chromogens. Although coloring matters have been subjected to numberless investigation by chemists, very little is known about their real constitution. Coloring matters are generally odorless, with a rough taste, soluble, some in water, others in alcohol. Indigo and alizarine can be sublimed but most are decomposed by a comparatively slight elevation of temperature. They all consist of carbon, hydrogen and oxygen, to which in some cases nitrogen is added. Some exhibit a weak acid tendency, combining with the oxides of lead, copper and especially tin, iron and aluminum, and forming insoluble colored compounds called «lakes.» Some have the power of attaching themselves permanently to different vegetable and animal fibres, as silk, wool, cotton and linen; others are unable to give a color which will not redissolve in water; in such cases the fibre is mordanted, that is, treated with one of the metallic oxides just mentioned, and then, when immersed in the color, the insoluble lake is precipitated in the fibre. Many coloring matters are liable to change by exposure to daylight; they are also affected by a number of chemical reagents — certain blues, for example, are turned green by alkalis, and red by acids; they are destroyed by nitric acid, bleached by chlorine, decolorized, but not always permanently destroyed, by sulphurous acid, sulphuretted hydrogen, etc.

Of the vegetable coloring matters the yellows are the most abundant, and different shades are obtained from different plants: fustic, turmeric, quercitron, Persian berries, morindin, saffron, arnotto, purree, chrysophanic acid and others; of the blues, indigo and litmus are the most familiar; and of the reds and purples, madder, logwood, Brazil-wood; safflower and a few more. Most of these colors require complicated operations to separate them in the pure state.

The only green coloring matter known, of no importance as a dye, but indispensable to the life of the plant, is chlorophyll. It was formerly supposed to be a simple substance. It was obtained from an alcoholic extract of leaves by adding lime, then decomposing the lime-chlorophyll compound with an acid, and agitating with ether, from which the chlorophyll was got by evaporation. But by another process it was found that it could be separated into two bodies, one yellow, the other blue; and by the application of the spectroscope, Stokes showed that chlorophyll contains four coloring matters, two yellow and two green, differing in optical properties. By further study in the same direction Mr. Sorby thinks he has proved that besides the greens there are four or five distinct yellow coloring matters, to which he has given special names. It is quite obvious, if this be so, that our knowledge of the nature of chlorophyll is just beginning, for each coloring matter will become an object of chemical and physiological investigation, and not till then will it be possible to say how chlorophyll is produced and acts in a plant. Experiments have been recently made to elucidate precisely the fading of chlorophyll when exposed to light, a change which is accompanied by altered spectrum bands, but in their present state they are too inconclusive to be detailed here.

The chief animal coloring matters are those of the blood, the bile, the urine, the retina, of the muscle and of the skin. The blood's coloring matter is the well-known hemoglobin, while the pigments of the bile, bilimbim and its oxidation product, biliverdin, are derived from the blood pigments. Biliprasin and fuscin, bilicyanin, bilipurpurin and bilixanthin, are other bile pigments. They may be regarded as various products of oxidation and reduction of the initial bile pigments. Urochrome is the general name applied to the urinary pigments. Its exact composition is by no means definitely understood. In the retina there are a number of pigments or chromophenes. They are mostly lipochromes, or fatty pigments, and have been named rhodophane, chlorophane and xanthophane, these being red, green and yellow respectively. There is a further black pigment in the eye, fuscin, allied to the melanins of the skin and hair. The muscle pigments are identical with the blood pigments. The skin pigments belong to a group known as the melanins. It is undecided whether these are iron pigments or not.

The artificial coloring matters may be divided into two classes, those which exist ready formed in nature, as many of the common red and brown earths, or which are formed by the mechanical mixture of such naturally existing colors, and those which do not exist in nature, but are produced by chemical operations. The latter are of mineral or of organic origin, examples of the first class being afforded by Scheele's, Guignet's and other greens, artificial ultramarine, smalt and many others, and of the latter by Prussian blue and especially by the aniline colors. The artificial colors are more particularly described in the articles COAL-TAR COLORS; DYES; PIGMENTS.

COLORS, in the army, the flags carried by each dismounted regiment. The corresponding flags of mounted units are called standards. They differ from colors in size alone. Each British infantry battalion (formerly regiment) except rifles carries two colors, the royal or first color, and the regimental or second color; neither of these is now carried into battle. They are carried by subalterns and formerly were guarded by the respective chief non-commissioned officers of the companies, the color-sergeants. At present there are no color-sergeants. Each United States regiment or separate battalion carries the national and the regimental color or standard, the latter of the corps color, bearing the regiment's number; they are carried by non-commissioned officers, the color-sergeants, and guarded by two privates. In the navy the term colors is applied only to the national flag.

COLORS. See COAL-TAR COLORS.

COLORS IN ART AND SYMBOLISM. When a connoisseur examines an Oriental rug he takes into consideration the symbolic intent of the color scheme as well as of the motifs depicted. He remembers that, to the Mohammedan, green is a sacred color and must not be trodden on. Collectors of Chinese ceramics in examining examples claimed to belong to a certain reign in the Ch'ing Dynasty have to bear in mind that yellow was for some time in that Dynasty an Imperial color and its use strictly forbidden except for the Imperial court. Hence any other than the finest art work appearing on such a piece of porcelain containing yellow in its decorative composition proves it to have belonged to some other period. But while symbolism generally originated in the East its antiquity in and among the European peoples dates very far back. And the arts, both profane and ecclesiastical, have used colors with symbolical intent almost universally.

White.— As symbol of innocence and purity white has been adopted over a large portion of the globe even during prehistoric days. In pagan times we find it as symbol also of light, and the Druids in white robes sacrificed white oxen to the sun; the head of Osiris of the Egyptians wore a white tiara. The Romans dedicated white to Jupiter (god of light), and on the first day of January the consul, robed in white and mounted on a white horse, rode up to the Capitol to celebrate the triumph of Jupiter over the spirits of evil; the priests of Jupiter wore white vestments and the victims sacrificed to that god were white. The Greek priests sang sacred chants in white robes. In antiquity white was dedicated to the dead and was sign of mourning, and this remains so to this day with the Persians, Chinese and Indian Mohammedans. In old biblical lore white vestments were symbolical of the soul's regeneration and a recompense of the elected. Early Christian artists depicted God the Father draped in white and Jesus was pictured in white robes after the Resurrection. The dead were swathed in white and Pythagoras called the practice a happy presage of immortality. Aaron, the Jewish high priest, was commanded to wear a white garb in the sanctuary. In Christian art, white being considered emblem of innocence and purity, lilies are found in pictures of the Immaculate Conception; it was for the same reason that some monks and nuns of the Christian Church wore white robes. The Magi were robed in white. In Christian iconography white is represented by the diamond or by silver as emblems of light, innocence, virginity, faith, joy and love. But white roses opposed to red ones signified death, rest, killing of inordinate desires.

Black.— In pagan antiquity black represented the underworld. Black, as "the negation of colors" is symbolic of death, darkness and evil, also of falsehood and error, sorrow and vice. The illuminators of the Middle Ages represented Christ draped in black while wrestling with the Spirit of Evil, and in the 12th century, in Byzantine art, the Virgin Mary often has a black complexion symbolic of woe. Black for mourning and mortuary color is a very ancient tradition. Georgius writes: "Black is the third of the four sacred or canonical colors, and is used by the Roman Church (and formerly by the Eastern Church too) on penitential days." Black has also been considered as signifying counsel and antiquity, but in heraldry it is symbolic of prudence, wisdom and constancy in adversity and love. White and black in combination signify in Christian art purity of life and mourning or humiliation, as adopted by the Dominican and Carmelite orders. Black and yellow in combination were symbolical of the devil and his hosts. To the Moors black designates grief, obscurity and constancy.

Violet.— The Roman Catholic Church considered violet and black so closely allied as to use them indiscriminately for one another on days of mourning and fasting. Violet clothing was worn by cardinals and old women and was an acknowledgment of old age.

Purple.— To the Tyrians (whence came the purple dye) and Romans a purple robe or band of purple signified authority; it became the Roman symbol of majesty, and its use was allowed only for royalty and for persons in high office or for priests.

Blue.— Eusebius tells us blue was the color of the clothing of the gods, especially of Juno (Queen of the Heavens). In Christian art light blue (sky-blue) was symbol of divine eternity and human mortality, hence was used as a mortuary color. The coffins of the young were covered with blue cloth and the mortuary cloth was of this color; a red and a blue pall, one over the other, signified divine love, raising the soul to immortality. The baldachin, as emblem of heaven ("canopy of heaven") was blue beneath, and church *ceilings* (from the Latin *cælum*, "heaven") were generally painted blue and powdered with gold stars. Blue signifies likewise piety and sincerity, also contemplation. The Jewish high priests wore it about their garments as significant of divine contemplation, and the church copes and chasubles were frequently of this color, though it is no longer a vestment color. As an angel's garment in art blue is symbolic of faith and fidelity. In tradition and art the Virgin Mary wore a mantle of blue, in which case it symbolized modesty. This color when worn at the celebration of the Mass signifies humanity and expiation. In heraldry blue (*azure*) is symbol of chastity, loyalty, fidelity, good reputation. Blue to the Persian signifies air, to the Mongolian authority and power.

Red.— In symbolism red signifies life, love, passion, fire, heat. It is the color of blood and hence represented anger, war and incendiarism. Red lions, foxes, squirrels were sun and fire symbols. In Christian art red represents opposite attributes; it is sign of burning zeal for the faith, of energy and courage, also of cruelty and guilt of bloodshed. The Israelites stained their door posts with red as a sign that the Avenging Angel should allow life to its dwellers. Red is the prominent color in Passion Week and on Good Friday. Rose-color signifies divine wisdom with the Buddhist and Mohammedan. In modern times red is symbol of revolution and anarchy. Red flowers are love signs.

Yellow.— This color very generally signifies envy, hate, quarrelsomeness. In Christian art yellow was symbol of the sun, also of the goodness of God, of marriage and initiation, faith and fruitfulness. In Christian iconography we find the illuminators and miniature artists of the Middle Ages depicted Saint Peter in a yellow robe as faithful guardian of the Church. Yellow has been symbol of treason, hence in France the doors of traitors were daubed with yellow and Judas is often found clothed in yellow in pictures. In some countries the Jews, for betrayal of the Lord, were enforced to wear yellow clothing. In Spain the executioner wears yellow or red, the former indicating treason of the victim and red its punishment. In heraldry yellow is symbol of love, constancy and wisdom, or in opposition, inconstancy, jealousy and adultery. The Japanese consider golden yellow symbol of the sun, riches, joy, etc., hence their chrysanthemum fête. Yellow was a Chinese symbol of royalty, also of high office under royalty, hence the gift of the "yellow jacket" as insignia showing high regard of the Imperial court.

Green.— To the ancient Egyptians this color was symbol of hope, growth, joy of spring. In the Middle Ages green became symbol of unripeness, as green youth, also of poison, hence dragons and snakes were painted green. Green was supposed to be good for the eyes, and Theophrastus wrote that emeralds were mounted in rings for persons with bad sight to be looked at by them. To the Mohammedan green is a sacred color and symbol of immortality. In modern times green has come to signify envy.

Brown.— With the ancient Egyptians brown was dedicated to Typhon and in olden times was generally a sign of mourning. Compounded of red and black, this color has been also symbol of treason and evil deeds. In monastic robes it signified renunciation. The Moors considered it emblem of evil, and in Christian art, brown, the color of the dead leaf, symbolized spiritual death.

Gold.— In Christian art, when used as a background, gold meant majesty of the subject depicted; it was also used for the nimbi of saints as «glory.» Gold signifies purity, dignity, wisdom and glory.

Orange.— With the Buddhists and Mohammedans orange is the color symbolizing sorrow.

Clement W. Coumbe.

COLORS OF FLOWERS. See Flower; Flowers and Insects.

COLORS OF THIN PLATES. See Interference.

COLOSSÆ, kō-lŏs'ē, an ancient city in Phrygia, situated on the Lycus, a branch of the Mæander. Colossæ had disappeared by the Middle Ages, and it is uncertain whether it was superseded by the town of Chonæ in its neighborhood, or whether Chonæ was Colossæ with only a change of name. It was first mentioned by Herodotus, Xerxes passed through it on his march to Sardis, 481 b.c., and it was a place of considerable mercantile importance in the time of Strabo. One of Paul's epistles was addressed to the Colossians, from which it is known that Colossæ was the site of one of the early Christian churches. Consult Ramsay, 'Cities and Bishoprics of Phrygia' (Vol. I, 1895).

COLOSSAL CAVERN, The. A large cave discovered in 1895, the entrance to which is about one and a half miles distant from the entrance to the Mammoth Cave, of Kentucky. On account of its immense size and the varied character of its formations, the Colossal Cavern is a most worthy rival of the Mammoth Cave. The Louisville and Nashville Railroad Company purchased the Cavern in 1896; acquired the land under which its course was found to run, and widened narrow passageways, smoothed rough places, built stairways and did many other things to make exploration easy. There are four separate entrances to the Cavern, only one of which (an artificial entrance) is used by visitors. Among the attractions of the Cavern are Colossal Dome, 135 feet high, which is the most symmetrical as well as one of the largest domes known; Vaughn's Dome, 78 feet in height, which is approached through a magnificent canyon, about 300 feet in length; the Twin Pits, 65 feet deep; the Lover's Gallery, 400 feet long; the Ruins of Carthage, 400 feet long and 100 feet wide; Pearly Pool; Pulpit Rock, and Dining Room.

COLOSSEUM. See Coliseum.

COLOSSIANS, Epistle to the. An epistle of the Apostle Paul addressed to the «Saints and faithful brethren who are at Colossæ.» Colossæ, though 100 miles east of Ephesus and less important than the adjacent Laodicea (Col. ii, 1) and Hierapolis (iv, 13) in the Lycus Valley, yet lying like them on the great trunk road which joined the Ægean with Syria, was in living communication with «all the [Roman] world» (Col. i, 6). Paul the apostle may have passed that way from «the upper country» to Ephesus (Acts xix, 1) but none of his future disciples saw his face in that region (Col. ii, 1). It was rather through his two years daily reasoning in the school of Tyrannus that «all they that dwelt in Asia heard the word of the Lord, both Jews and Greeks» (Acts xix, 9f). Epaphras, finding his way from Colossæ (Col. iv, 12) to the provincial capital, became Paul's «fellow-servant and faithful minister of Christ on his behalf» to the towns on the Lycus (Col. i, 5–7; iv, 12f) and the founder of the churches in Colossæ, Laodicea, and Hierapolis. Two other Colossians, Philemon and Archippus, are named fellow-workers and the latter is exhorted to fulfil his «ministry received from the Lord» (Philem. 1; Col. iv, 17). Two house-churches are mentioned, one in the house of Apphia at Colossæ (Philem. 2) and another in that of Nymphas in Laodicea (Col. iv, 15). The membership of the churches included slaves and their well-to-do owners (Col. iii, 22ff iv, 1; iii, 11; Philem. 15f).

The content of Paul's gospel to this Gentile population (Col. i, 27) may be divined from his contemporary first Corinthian epistle, in which his characteristic stress is laid upon the transcendent and cosmic rank of Christ, as sole divine agent in all creation (1 Cor. viii, 6) and upon his unique redemptive function through his incarnation, death and resurrection (1 Cor. xv, 1–4; i, 23–24, 30; vi, 11). The apostle's foreboding that after his departure from Asia some of his own converts would «speak perverse things to draw away the disciples after them» (Acts xx, 30) was to be realized in Colossæ. His failure to visit the valley churches, a natural local jealousy toward Epaphras and scant regard for his teaching ability, gave an ambitious leader (note singular number in ii, 4, 8, 16, 18) an opportunity to promulgate an alleged higher type of doctrine, with syncretistic elements of ultimate Jewish (ii, 14, 11, 16), and perhaps Grecian (ii, 8, 23; i, 26; ii, 3), Phrygian (ii, 12) and Oriental (i, 16) origin. The new teaching, harmonizing with the inherited prepossessions of Gentiles but newly won to the Christian faith, and addressed not to the common herd but to persons flattered as possessed of superior intelligence, made a headway which Paul's unlearned sponsors found themselves powerless to arrest. They felt that no less potent a reasoner than he of the school of Tyrannus, now unfortunately a prisoner in distant Rome, could cope with the subtle and sinister propaganda. Epaphras, therefore, takes the bold venture of an arduous and perchance futile journey all the way to the imperial capital. He finds the apostle still among the living and prepared to meet the dire emergency in the valley churches. Tychicus, possibly an abler representative than Epaphras, is armed with oral instructions and dispatched with a circular letter (our so-called «Ephesians») to «the churches of Asia» (1 Cor. xvi, 9), a second letter to the Colossian church dealing with the heresy, and a personal letter to Philemon, together with a «living epistle» (2 Cor. iii, 2) in the person of the latter's converted runaway slave, Onesimus (Col. iv, 7–9; Eph. vi, 21; Philem. 10–16).

Paul's method in refuting the false teaching at Colossæ is to renew his earlier emphasis upon the transcendence and immanence of the crucified and risen Christ Jesus (Col. i, 15–17) as taught in the school of Tyrannus (1. Cor. xv, 1–4; viii, 6; iii, 23). He whom they have «received as Lord» (Col. ii, 6) is One «who is before all things,» «through whom and unto whom all things have been created,» and «in whom all things consist» (i, 16–17), who therefore is «all, and in all» (iii, 11) and «in them, the hope of glory» (i, 27). After the opening salutation, thanksgiving for their Christian graces of faith, love and hope, and prayer for their deeper spiritual knowledge and for life worthier the indwelling Christ, he sets forth in the *doctrinal section* (i, 13–ii, 3) the pre-eminence of Christ as Redeemer from sin, unique revealer of God, creative agent and sustainer of the universe, including every rank of intermediate beings (i, 13–17); and as crucified and risen Head of the Church, the sole divine mediator for restoring harmony in heaven and earth, through the Gospel divinely entrusted to Paul for them and all Gentiles of every class and condition (i, 18–ii, 3). The polemical section following (ii, 4–iii, 4) contrasts the sufficiency of Christ's gospel with the insufficiency of the false teaching. Cleaving to Christ and his gospel, they are to accept no false human philosophy as a substitute (ii, 4–8); for in him dwells the whole living omnipotent Deity, as in no lesser being, to meet every human need (ii, 9–10); to raise them with himself from the corruption and death of sin to the life of obedience, to put an end to the servitude of the Mosaic law and of the powers of evil (ii, 11–16). The new ceremonialism is shadow: but Christ is substance; its worship of angels a fiction of the imagination, replacing personal and vitalizing union with Christ, the living Head; its ascetic rules a pitiful substitute for ethical death and victorious life with Christ over the power of the flesh (ii, 20–iii, 4). The *hortatory application* follows: Put off the old nature: put on Christ! (iii, 5–iv, 6). United to Christ they are to reproduce His own death to the world and its vices (iii, 5–11), His life of love and joyous service to God and man (iii, 12–17); in their homes they are to incarnate His spirit (iii, 18–iv, 1) and live His life of prayer for the extension of His gospel (iv, 2–6). The *personal conclusion* (iv, 7–18) contains a reference to Tychicus and Onesimus, salutations, instructions as to exchange of epistles with the Laodiceans and the autograph signature.

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Marcus D. Buell,
Professor of New Testament Greek and Exegesis, School of Theology, Boston University.

COLOSSUS, kō-lŏs'ŭs, in sculpture, a statue of enormous magnitude, from which our adjective colossal is derived. The people of the East from the most ancient times have been celebrated for colossal sculpture. The pagodas of China and of India and the excavated caverns of the East abound with colossi of every description. The Asiatics, the Egyptians, and in particular, the Greeks, have excelled in these works. The celebrated colossus of Rhodes was reckoned one of the seven wonders of the world. It was raised by the Rhodians in honor of Apollo. Strabo, Pliny and other ancient authors who lived at the time that the colossus of Rhodes is said to have been in existence have given its height as 70 cubits, or about 105 feet. Other authors who flourished since its destruction report its height at 80 cubits. The statue stood at the entrance of the harbor of Rhodes, but there is no authority for the statement that it bestrode the harbor mouth and that the Rhodian vessels could pass under its legs. Of other colossal statues of ancient times the most celebrated are the Olympian Zeus and the Athena of the Parthenon, both the work of Phidias. The virgin goddess was represented in a noble attitude, 26 cubits or 39 feet in height, erect, clothed in a tunic reaching to the feet. In her hand she brandished a spear, and at her feet lay her buckler and a dragon of admirable execution, supposed to represent Erichthonius. The statue of Zeus was 60 feet high. The earliest colossus recorded to have been sculptured in Rome was the statue of Jupiter Capitolinus, which Spurius Carvilius placed in the capitol after his victory over the Samnites.

Among modern works of this nature are the colossus of San Carlo Borromeo at Arona in the Milanese territory; the four colossal statues at Paris in front of the façade of the palace of the Chamber of Deputies, representing four of the greatest French legislators; and a statue of Germania, 34 feet high, on a pedestal over 81 feet high, erected near Rüdesheim in commemoration of the unification of the German Empire. In the United States a figure of «Liberty Enlightening the World,» 151 feet high on a pedestal 155 feet high, has been erected in New York, overlooking the harbor and serving as a beacon. It was the work of the French sculptor Bartholdi, and was constructed mainly through the efforts of a French-American Union formed in 1874. In 1880 it was presented by France to the United States, and six years later it was placed on its present site, Bedloe's Island.

The statue of Charles IV of Spain at the head of the Paseo de la Reforma in the City of Mexico is the largest equestrian statue on the American continent and the second largest in the world.

COLOSTRUM, the name given to the first milk yielded after the birth of the young. It differs from ordinary milk in appearance and composition. It contains a larger percentage of ash and total solids than ordinary milk and a greater proportion of albumin to casein, but less sugar of milk. There are also minute fat granules known as colostrum bodies and which are believed to be the débris of the cells of the mammary gland. Colostrum has a purgative effect upon the new-born infant and removes the meconium from the fœtal intestine. Colostrum gradually assumes the characteristics of normal milk within a few days after parturition.

COLQUHOUN, ko-hoon', **Archibald Ross,** British colonial administrator, explorer and author: b. off Cape of Good Hope, March 1848; d. 18 Dec. 1915. He entered the Indian Public Works Department in 1871, and was a member of the mission to Siam in 1879. In 1881–82 he explored the proposed railway route between Burmah and China, and was deputy-commissioner of Upper Burmah 1885–89. He was administrator of Mashonaland 1900–02. In 1895 he visited America to explore the Nicaragua and Panama Canal routes. He had traveled extensively and was the author of numerous works, including ‘Among the Shans’ (1885); ‘The Key of the Pacific’ (1895); ‘China in Transition’ (1898); ‘The Mastery of the Pacific’ (1902); ‘Germany and Sea Power’ (1909).

COLQUHOUN, John, Scottish writer on sport: b. Edinburgh 1805; d. 1885. He was educated at the university of his native city. In 1840 he published ‘The Moor and the Loch,’ an extremely diverting account of his adventures as a sportsman. The volume was immensely popular and an autobiographical preface was added to the fourth edition (1878). Other works by him are ‘Rocks and Rivers’ (1849); ‘Salmon Casts and Stray Shots’ (1858); ‘Sporting Days’ (1866).

COLQUHOUN, Patrick, English magistrate and advocate of police reform: b. Dumbarton 1745; d. 1820. He went to Virginia at an early age and there became a successful merchant. In 1766 he returned to Glasgow, became prominent in the public affairs of that city, founded the Glasgow Chamber of Commerce in 1782, the oldest institution of the kind in Great Britain. In 1789 he removed to London, where in 1795 he issued his ‘Treatise on the Police of the Metropolis,’ in which he advocated a complete reform of the London police system. Many of his recommendations were adopted subsequently by the authorities. In 1798, having come into notice through the inauguration of important municipal reforms, he was appointed magistrate at Westminster. Other works by him are ‘System of Education for the Laboring People’ (1806); ‘On Indigence’ (1806); ‘On the Population, Wealth, Power and Resources of the British Empire’ (1814, 2d ed., 1815).

COLQUITT, Alfred Holt, son of Walter T. Colquitt (q.v.), American legislator: b. Walton County, Ga., 20 April 1824; d. Washington, D. C., 26 March 1894. He was graduated at the College of New Jersey in 1844 and settled in his native State as a lawyer. He served in the Mexican War, and was elected to Congress in 1852 as a Democrat. Upon the outbreak of the Civil War he entered the Confederate army as a captain and rose rapidly to the rank of major-general. He was governor of Georgia in 1876–82 and United States senator in 1882 and in 1888.

COLQUITT, Walter T., American lawyer: b. Halifax County, Va., 27 Dec. 1799; d. Macon, Ga., 7 May 1855. He was educated at Princeton; was admitted to the bar in 1820; became a district judge in 1826, holding the first court ever held in Columbus, Ga. He was a successful lawyer, and in criminal practice was without a rival in his State. He was a member of the Georgia State senate 1834, 1837; a representative in Congress 1839–42; a United States senator 1843–55, and a member of the Nashville Convention 1850.

COLT, LeBaron Bradford, American jurist: b. Dedham, Mass., 25 June 1846. He was graduated at Yale in 1868 and two years later from the Columbia Law School. He practised law in Chicago and Providence, R. I., and from 1879 to 1881 was a member of the Rhode Island House of Representatives. In 1881 he became United States district judge for Rhode Island, and in 1884 was made United States circuit judge for the first judicial circuit. He retired from this office in 1913 when he was elected to the United States Senate for the term 1913–19.

COLT, Samuel, American inventor: b. Hartford, Conn., 19 July 1814; d. there, 10 Jan. 1862. He had a common school education and was employed in his father's textile mill, but went to sea as a sailor when 15. His attention being drawn to firearms while at sea, he began to perfect a revolver and patented it in 1835. Its great success led to the erection by him at Hartford of one of the most extensive weapon factories in the world. Among his other inventions are a battery for submarine harbor defense, and the first submarine telegraph cable.

COLTMAN, Robert, Jr., American physician: b. Washington, 19 Aug. 1862. He was graduated at the Jefferson Medical College, Philadelphia, in 1881 and began the practice of medicine in the same year. In 1896 he became professor of anatomy at the Tung Wen College, Peking, and in 1898 was appointed professor of surgery at the Imperial University of the same city. He was appointed foreign correspondent of the Chicago *Record* in 1900, to which he sent out during the siege of Peking by the Boxers the first message that reached the outside world. He is now the representative of the Standard Oil Company of New York at Pekin, China. He published ‘The Chinese, their Present and Future: Medical, Political and Social’ (1891), and ‘Yellow Crime, or Beleaguered in Peking’ (1901).

COLTON, Arthur Willis, American writer: b. Washington, Conn., 22 May 1868. He was graduated at Yale in 1890, held the Foote scholarship there 1890–93, and was instructor in English literature 1893–95. Since 1895 he has devoted himself to writing, and his stories, essays and verse have appeared in the *Atlantic Monthly*, *Scribner's*, *Harper's* and other magazines. In book form he has published ‘Bennie Ben Cree’ (1900); ‘The Debatable Land’ (1901); ‘The Delectable Mountains’ (1901); ‘Tioba, and Other Tales’

(1903); ‘Post Argent’ (1904); ‘Belted Seas’ (1905); ‘The Cruise of the Violetta’ (1906); ‘Harps Hung Up in Babylon’ (1907). In 1906 he became librarian of the University Club, New York.

COLTON, Charles Henry, American Roman Catholic prelate: b. New York, N. Y., 15 Oct. 1848; d. Buffalo, 9 May 1915. In the schools of that city he pursued his elementary studies, later attended the Latin school connected with Saint Stephen's Church, and in 1869 began a theological course at Saint Francis Xavier's College. After three years he repaired to Saint Joseph's Diocesan Seminary, Troy, N. Y., where he was ordained priest 10 June 1876. He was then made assistant pastor of Saint Stephen's Church, New York, and, in 1886 assumed charge of the church of Our Lady of Mercy, Port Chester, N. Y. In 1887 he was recalled to New York to aid the Rev. A. J. Donnelly of Saint Stephen's. Father Colton was named administrator of the parish, and subsequently appointed rector. In 1896 Archbishop Corrigan appointed him chancellor of the New York diocese and upon Bishop Quigley's promotion to the archbishopric of Chicago, Ill., the Holy See chose Father Colton to succeed him as bishop of Buffalo. He was consecrated in New York by Archbishop (now Cardinal) Farley, 24 Aug. 1903.

COLTON, Gardner Quincy, American scientist: b. Georgia, Vt., 7 Feb. 1814; d. Rotterdam, Holland, 11 Aug. 1898. He discovered the anæsthetic properties of nitrous oxide, or «laughing gas,» credit for which is also given to Dr. Horace Wells. He perfected an electric motor in 1847.

COLTON, George Radcliffe, American public official: b. Galesburg, Ill., 10 April 1866. He was educated at Knox College, was a ranchman in New Mexico in 1881–86, member of the Nebraska House of Representatives 1889–90 and national bank examiner for the district of Nebraska in 1897. He went to the Philippine Islands as lieutenant-colonel of the First Nebraska Volunteer Infantry, organized the customs service at Manila upon the American occupation and served with it until 1905, when he went to the Dominican Republic and organized the Dominican customs receivership under the modus vivendi between the United States and the Dominican Republic. In 1907–09 he was insular collector of customs for the Philippine Islands. He drafted and presented to Congress the tariff for the Philippines, enacted by special session of Congress 1909, and also took part in drafting provisions of the Payne Bill relating to free trade between the United States and Philippines. In 1909–13 he was governor of Porto Rico.

COLTON, Walter, American writer: b. Rutland, Vt., 9 May 1797; d. Philadelphia, Pa., 22 Jan. 1851. He became professor of moral philosophy and *belles-lettres* at Middletown Academy, Conn. (1825); in 1828–30 was editor of the *American Spectator,* Washington. In 1845 he went to California, and in Monterey established the first newspaper of the State, called the *Californian.* He wrote several books of interest, including ‘Ship and Shore in Madeira, Lisbon and the Mediterranean’ (1835); ‘Visit to Athens and Constantinople’ (1836); ‘Three Years in California’ (1850); Deck and Port’ (1850); ‘The Sea and Sailor’ (1851).

COLTON, kōl'tŏn, Cal., city in San Bernardino County, 58 miles east of Los Angeles, on the Atchison, Topeka and Santa Fé, the Southern Pacific and other railroads. Great quantities of fruit and vegetables are shipped from here and the city has railroad repair shops, canneries and packing-houses, cement works, flour mills and fertilizer works. The city owns the waterworks and electric-lighting plant. Pop. 3,980.

COLUBRIDÆ, kō-lū'brĭ-dē, a family of snakes, typified by the limited genus *Coluber* of Linnæus, which comprises nine-tenths of all living snakes. As arranged by Cope the family contains non-venomous snakes (*Aglypha*) only, but under Boulenger's more approved system it embraces both the *Opisthoglypha* and *Proteroglypha,* which include all the poisonous snakes except the vipers and pit-vipers (qq.v.). Even in the limited sense, a vast majority of snakes, not less than 1,000 species, fall within the family. All are of relatively small size, only a few giants attaining a length of 10 feet, and all have continuous rows of small teeth in both jaws, and none enlarged to serve as poison fangs. The head scales are large non-imbricate plates, but the body scales usually overlap, tile-like. They are oviparous or ovoviviparous and feed on insects, small mammals, birds, etc., though a few, as the king-snake, habitually devour poisonous serpents. Most of them are terrestrial, but some are aquatic and others arboreal. Nearly cosmopolitan in their distribution, but very sensitive to the influence of cold, they are absent from the polar regions, and in temperate climes hibernate during the winter. Many species are found in North America. (See BLACKSNAKE; CORNSNAKE; GARTERSNAKE; PINESNAKE; WATERSNAKE; etc.). Consult books mentioned under SNAKE, especially Cope, ‘Snakes of North America’ (Ann. Rept. Smiths. Inst. 1898, Washington 1900); and Gadow, ‘Amphibia and Reptiles’ (New York 1901); ‘Catalogue of Snakes of the British Museum,’ where full references will be found.

COLUGO, kō-loo'go, **COBEGO,** kō-bā'gō, or **KAGUAN,** kä'gwän, an East Indian insectivore of the only genus of the family *Galeopithecidæ,* as yet imperfectly known. It is a slender creature about 18 inches long, its body covered with peculiarly sleek fur and provided with a parachute of membrane furred on both sides and extending from the neck nearly to the tip of the tail, by which it is enabled to make long sailing leaps like a flying-squirrel, a feature which gives it its technical name, *Galeopithecus volitans.* Like the bat, which the colugo resembles in various actions, it is a creature of twilight, hanging suspended by its hind legs from branches during the glare of day and seldom venturing forth in the complete darkness of night. It feeds upon leaves, fruit and insects. Consult Moseley, ‘Notes by a Naturalist on H. M. S. Challenger’; Wallace, ‘Malay Archipelago’ (New York 1869).

COLUMBA, Saint, apostle of the northern Picts of Caledonia and founder of numerous monasteries in the Hebrides and the Scottish mainland: b. 7 Dec. 521 in the territory of the Kinel-Conal, modern Donegal. He was a scion of the illustrious race of Conal and was thus of kin to the northern princes of Ireland and of the Gælic princes of Scotland. Whether his name, or surname, Columba, is Latin or a Latin modification of a Gælic name cannot be determined; it appears also in the form Colm (whence the name Malcolm, servant or devotee of Columba); and the saint is also known as Columkillé (Columba of the churches, or *cellae*, the c in Gælic being equal to k), because of the great number of churches and monasteries he founded both in Ireland and in Scotland and the isles. He became a monk in his youth in the monastery of Moville in Donegal, and at the age of 30 was a priest. Among the monastic establishments founded by him in Ireland are those of Daire-Calgaich (Calgach's oak grove), the site of the famous city of Derry or Londonderry; and Dair-mach (oak of the plain) where now is Darrow. This was the greatest of all his Irish monasteries. It is worthy of note that after his migration to Scotland, he and his immediate successors in Iona exercised jurisdiction over these Irish monasteries. About the year 563, being then under excommunication for the part he had taken in the bloody battle of Cooldrevny, he set sail for North Britain with a band of his monks to preach the Christian religion to the still pagan Picts of northern Caledonia. He was entertained hospitably by his kinsman, Conal, king of the Scots in Argyll (Airer-Gædhill, land of the Gæl) who gave him for his residence the island in the Hebrides later called I, or Iona and I-Columkillé. Having established in Iona a monastery and training-school of missionaries, he crossed over to the country of the northern Picts — the southern Picts had already been converted to Christianity — and to them preached the gospel with such effect that their king Brude and the whole people embraced the faith. Before Columba's death all northern Caledonia was Christian and monasteries were very numerous whether on the mainland or in the islands. Iona was the mother house, and thence Columba and his successors, abbots of Iona, governed not only the monastic houses but the churches also; and though there were bishops for the special functions of the episcopate — the ordering of priests, for example, the administering of confirmation, the consecrating of churches and the like — those bishops were subject to the authority of the abbot of Iona, though he was never more than a presbyter in ecclesiastical order. What time was at his disposal amid the many cares of his station, Columba devoted to study and to transcription of the Scriptures. On 8 June 597 he was employed in this labor, transcribing the psalm Benedicamus Domino (the 33d in the Septuagint and the Vulgate, but the 34th in the authorized English version); after penning the words "Inquirentes autem Dominum non minuentur omni bono" — they who seek the Lord shall want no manner of thing that is good. "Here," he said, "I must stop; what follows let Baithen write," and laid down the pen. At the midnight hour he was in choir for the office of Matins, having come to the church unaided and knelt at the altar; through sleep he in a few moments passed to death. Three Latin hymns are attributed to him, and, in addition, some Celtic poems. The story of his life and miracles was told first by Cuimine Ailbhe, who was also abbot at Iona (printed at London 1789 and at Paisley 1889). Based on this account Adamnan, the ninth abbot, wrote another 'Vita Sancti Columbæ' (edited by Reeves, Dublin 1857; J. T. Fowler, London 1894–95). Consult Troup, 'Saint Columba; the Lord's Song in a Strange Land' (London 1913).

COLUMBA, or COLUMBA NOACHI, nō-ā'kī (Lat. "Noah's dove"), a small constellation of stars south of Lepus and Canis Major, about the time of whose discovery there are different statements. It is generally believed that it was first named by Royer in 1679 or 1680. This is easily disproved by the fact, seldom noted, that Bayer in his 'Uranometria,' published in 1603, on the 37th map, just below Canis Major, pictures the dove flying with the olive-branch in its mouth. Dr. Gould states that it was mentioned by Petrus Plancius, an eminent Dutch geographer and teacher of Petrus Theodori. The latter died in 1596. The constellation is known to-day by the simple name of Columba, and is situated between Puppis, Pictor, Cælum, Lepus and Canis Major.

COLUMBÆ, a sub-order of charadriiform birds containing the pigeons, fruit-eating pigeons, sand-grouse, etc. The typical family is *Columbidæ,* or true pigeons and doves. See PIGEON.

COLUMBANUS, kŏl-ŭm-bā'nŭs, missionary and founder of a monastic order, that of the Columban monks, was born in Ireland about 543; died in his monastery of Bobbio, in the Apennines, Italy, 21 Nov. 615. The order founded by him was for a while hardly inferior to the order of Saint Benedict in number of monasteries or in the services it rendered to the Church. He was an alumnus of the great monastery of Benchor or Bangor, in Ulster, and thence in his 45th year he went to France as a missioner, accompanied by 12 young disciples. In France he founded the monasteries of Luxeuil, Arnegray and Fontenay, giving to the monks a rule identical with that of the Celtic monasteries of Ireland. He gave offense to the French bishops by the fashion of his tonsure and by his observance of Easter in accordance with the calculation of the Eastern churches. And his apostolic outspokenness in rebuking the vices of the Burgundian court, the king (Thierry II) and the queen mother (Brunehaut) led to his expulsion from that country. He now decided to cross the Alps and labor as a missionary in Italy. On his route thither he tarried a while among the Swiss, preaching the gospel on the shore of Lake Constance. One of his 12 companions, named Gallus, falling sick, was left behind when the missionary party resumed their travel: this Gallus afterward laid the foundations in Switzerland of a monastic institute which later was called by his name, Saint Gall (Sankt Gallen) and which was one of the notable centres of monasticism in Europe. Columbanus, in 612, founded the great monastery of Bobbio in the Apennines, giving to the monks of that house, which soon was recognized as the mother-house of a multitude of abbeys and monasteries, a rule of great austerity. The keynote of it is implicit, unquestioning obedience in all things to the abbot or superior. It prescribes perpetual silence save where speech is absolutely necessary. The use of animal food of all sorts is interdicted. The monks are allowed one meal daily, taken at eventide, and it consists of vegetables and bread. The monks of his monasteries, called Columbans, came under the Benedictine rule in the 8th century and the Columban order was merged in the Benedictine. Columbanus was a man of learning, acquainted not only with the Latin language current in his time, but with the classic Latin authors, as also with the Hebrew and Greek languages. He left a few writings, all in Latin; they have all been published more than once. They comprise his Monastic Rule (Regula Cœnobialis); a few poems of considerable merit; 16 brief sermons and several letters of value for ecclesiastical history. A town in Lombardy, San Colombano, perpetuates the memory of this Celtic missionary to Italy.

COLUMBIA, the popular name of the United States; derived from Columbus and applied to the greatest nation of the New World from a feeling of poetic justice to the memory of its great discoverer.

COLUMBIA, British. See BRITISH COLUMBIA.

COLUMBIA, District of. See DISTRICT OF COLUMBIA.

COLUMBIA, Mo., county-seat of Boone County, situated 10 miles north of the Missouri River, on the Wabash and the Missouri, Kansas and Texas railroads. It was first settled in 1815 by Kentuckians and is governed by a mayor and a council of eight members, who are elected semi-annually. The city has four banks with a combined capital of $370,000. Columbia has many public and educational institutions, including Missouri University, Missouri State Farm and Experiment Station, Parker Memorial Hospital, Stephens Baptist College for Women, Christian College for Women, Columbia Normal Academy, Columbia Business College, University Military Academy and high school. Its industries include flour and planing mills, grain elevators, a packing plant and a shoe factory. Pop. 9,662.

COLUMBIA, Pa., borough, in Lancaster County, on the Susquehanna River and on the Pennsylvania and the Philadelphia and Reading railroads, about 26 miles southeast of Harrisburg and 80 miles from Philadelphia. The place, originally called Wright's Ferry, was founded in 1726 by Quakers from Chester County. Columbia was one of the places proposed, in 1789, for the capital of the United States. The bridge, which connected Columbia with Wrightsville, was burned in 1863, to prevent the Confederate forces from proceeding to Philadelphia. A fine bridge, one of the longest in the United States, has taken the place of the old one. Columbia is an industrial and trade centre of considerable importance. The chief manufactures are foundry and machine-shop products, boilers and engines, flour, beer, wagons, glass, automobiles, shirts, silk, lace and lumber. The United States census of manufactures for 1914 showed 61 industrial establishments of factory grade, employing 2,315 persons, of whom 2,140 were wage earners, receiving annually a total of $824,000 in wages. The capital invested aggregated $3,513,000, and the yearly output was valued at $3,341,000: of this, $1,486,000 was the value added by manufacture. It has three national banks, a high school, a state armory and the value of its taxable property is about $3,000,000. Pop. 11,454.

COLUMBIA, S. C., State capital, and county-seat of Richland County, situated in the centre of the State, on the east bank of the Congaree River, at the head of navigation, two miles below the junction of the Broad and Saluda. It is on the Atlantic Coast Line, the Seaboard Air Line, the Southern and the Columbia, N. and L. railroads, 129 miles northwest of Charleston, 82 miles northeast of Augusta, Ga., and 153 miles north of Savannah.

Topography.— Columbia is one of the handsomest cities of its size in the country and in a district noted for sanatoria. It is built on a sand-hill plateau which forms a bluff 100 feet high at the river and sloping away on all sides, giving excellent drainage. The streets which are 100 feet wide are at right angles to each other, and there are four avenues 150 feet wide radiating from the capitol. All the chief streets are boulevards, with handsome shade-trees not only along the sides but in the centre. There is also a fine park.

Public Buildings.— The business buildings are rapidly increasing in size and architectural beauty. The granite State-house, costing $4,000,000 and modeled on the capitol at Washington, is one of the most imposing in the South and one of the handsomest in the country. Spacious grounds surround the capitol, and among the city's attractions are the monuments, which include a «Palmetto Tree» in bronze. The executive mansion, the government building, the county courthouse, the city hall, the State insane asylum and State penitentiary are also noteworthy. The city is rich for its size in important educational institutions: South Carolina College, now the University of South Carolina, founded 1801; the Presbyterian Theological Seminary, also very old; Lutheran Theological Seminary; Columbia Female College (Methodist Episcopal Church South), founded 1859; Allen University (African Methodist Episcopal), 1881; the College for Women (Presbyterian) 1890; and Benedict College (colored). It has also a well-attended public school system and two high schools.

Municipal Conditions.— The principal streets are asphalt; the roads are chiefly of sand and clay and are excellent. The city owns its waterworks and has gas, electric light and power and an electric railway system. Columbia was the first city in South Carolina, and one of the first in the Union to adopt the commission plan of government.

Business Interests.— The city affords one of the most remarkable instances of manufacturing development in the country. It is in the heart of a fertile cotton district and near forests of pine, oak, walnut and maple; but its site is the key to an important future. A rocky shelf projecting for four miles from the junction of the Broad and Saluda forms the bed of the Congaree, 500 feet wide, which plunges down it in rapids, affording immense power, which is made available by a canal 2⅞ miles long, 110 feet wide at bottom and 150 at top, with 31 feet fall, furnishing 14,000 horse power, and operating dynamos which create electricity for manufacturing power, light and street railways. But the greatest establishments are independent of this except as a resource, using steam dynamos — for all Columbia's industries are run by electricity. In 1892, there was one cotton mill in the city employing 125 men. Now the great Whaley system of cotton mills includes four in Columbia, with 197,000 spindles, 4,840 looms and $3,100,000 invested capital. The Olympia mill, with 9 to 10 acres of floor space and over 100,000 spindles, is the largest in the world operating under one roof; the Granby and Richland are also large and well-equipped mills; and the three, owned by one company and employing almost 3,000 hands, are the nucleus of a large village of 500 acres owned by the company, with sewerage, fire department, electric street lighting, cottages wired and plumbed, churches, schools, etc. The Columbia Mills Company is also a great organization, capitalized at $1,500,000, and turning out over 20,000 bales of cotton duck a year. Besides this predominant industry, there are growing hosiery works, glass works which utilize the fine sand found nearby, four quarries of fine granite, large lumber works starting up and small miscellaneous industries. The vast beds of kaolin in the vicinity now supply outside potteries, but local works are contemplated. The United States census of manufactures for 1914 reported 71 industrial establishments of factory grade, employing 2,571 persons, of whom 2,228 are wage earners receiving $1,091,000 annually in wages. The capital invested aggregated $7,348,000 and the year's output was valued at $6,765,000: of this, $2,540,000 was the value added by manufacture. The rock ledge before mentioned extends two miles below the city with only four feet of water over it, dropping off to 10 feet or more at Granby. Deep water is now brought up to Columbia by a floating dam 15 feet high, costing $250,000, which enables vessels of 10 feet draft to come up to the city instead of unloading and trucking up from Granby as heretofore. Two steel steamers run from Columbia to Georgetown and will ultimately go to Charleston. This improvement makes Columbia the great distributing point for central and northern South Carolina.

History.— The town was settled about 1700, but remained farm land till 1786, when the people of the State demanded a capital more centrally located than Charleston, and Columbia village was laid out. The legislature first met there in 1790. In the Civil War it shared the general fortunes of the State, till Sherman's army entered it 17 Feb. 1865. The following night a fire broke out which lasted all the next day and laid over half the city in ashes, including a number of business blocks, private residences, schools, the railroad station, several churches and a convent, and destroyed a great quantity of cotton. Its development since is part of the general industrial awakening of the South. Pop. (1860) 8,052; (1870) 9,298; (1880) 10,036; (1890) 15,353; (1900) 21,108; (1910) 26,319; (1914) 33,500, not including the mill villages, chiefly that of the Whaley mills, with several thousand inhabitants, just outside the old city limits though close by. Since that time several suburbs have been annexed, giving Columbia a population (1915) 56,992.

Rawley W. Holcombe,
Secretary of Columbia Chamber of Commerce.

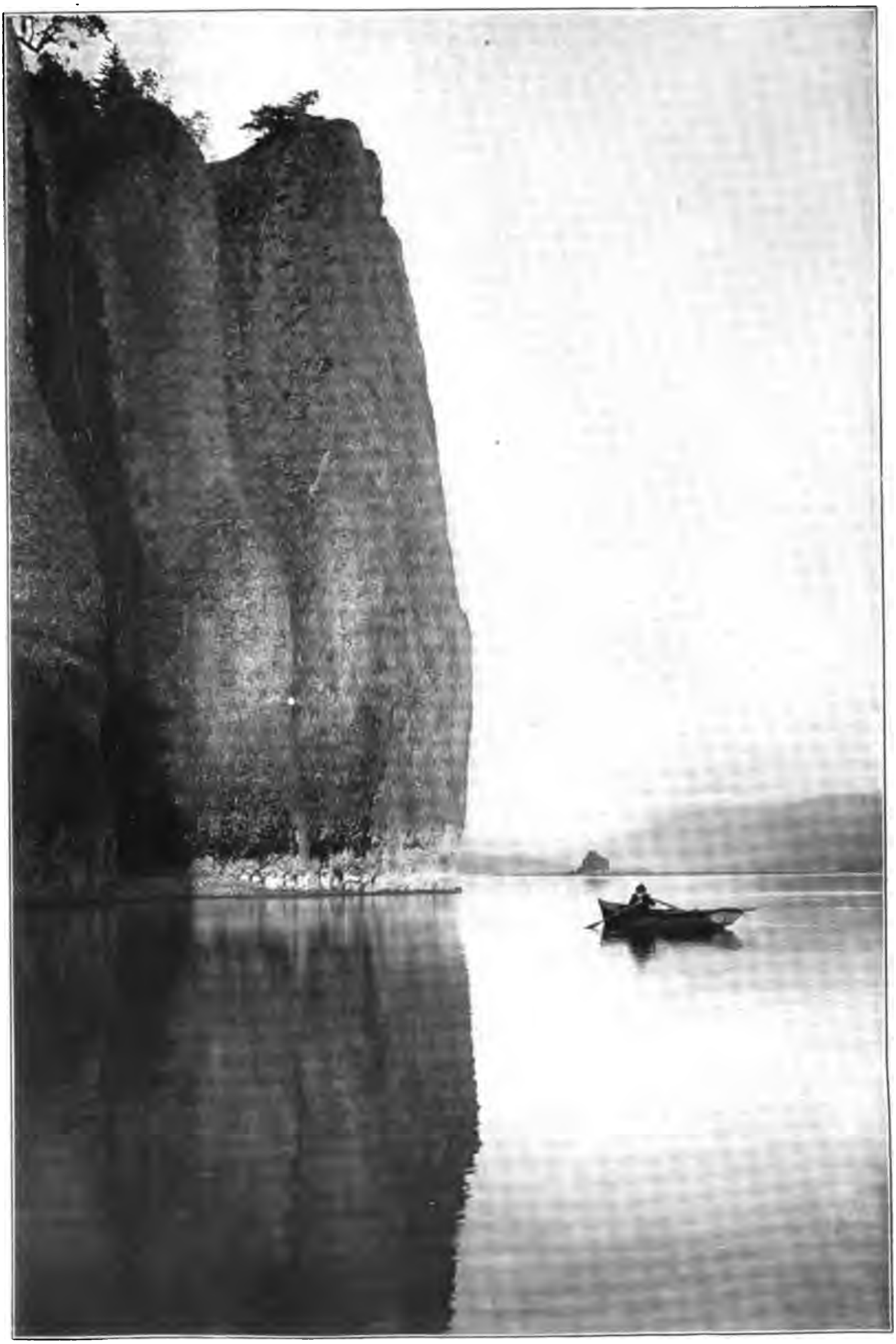
COLUMBIA, Tenn., county-seat of Maury County, situated on the Duck River and on the Louisville and N. and the Nashville, C. and Saint L. railroads. It is the trade centre of a fertile agricultural region, and has a stock yard, a grain elevator and cotton and flouring mills. It is the seat of Jackson College, two seminaries for young women and a military academy. It also has a United States arsenal. Pop. 5,754.

COLUMBIA, or **OREGON,** after the Yukon, the largest river on the western side of America. It rises in the Kootenay District of British Columbia, on the western slope of the Rocky Mountains, near mounts Brown and Hooker, in about lat. 50° N. Its course, which is very irregular, is generally southwest through British Columbia and Washington. It forms the northern boundary of Oregon for about 350 miles and enters the Pacific by an estuary 35 miles long and from 3 to 7 wide. Its estimated length is 1,400 miles, and the area drained by it and its tributaries, of which the largest are Clarke's Fork (with the Missoula, 700 miles long), and the Snake River (940 miles in length) along which are very remarkable canyons, has been computed to be 298,000 square miles. The river is broken by falls and rapids into separate portions, and formerly a bar across its mouth obstructed navigation. The construction of a jetty two and one-half miles long has provided a good harbor, but the silt deposit calls for constant dredging and other work. Sea-going vessels ascend the Columbia for 100 miles to the Willamette and from the junction with the latter to Portland (10 miles), while steamboats reached the Cascades (160 miles), where there was a portage of 6 miles which was bridged over by a railway; and beyond this another navigable stretch of 50 miles to the Dalles. In November 1896 the government completed a canal and locks at the Cascades, at an expense of nearly $4,000,000, and thus opened navigation to the Dalles, where a 14-mile railroad passes round the Great Dalles channel to the next section above (185 miles), beyond which there is a final part navigable for 250 miles by steamboats. The Columbia and its branches have 2,132 miles of navigable waters. The extraordinary abundance of salmon in the river has developed numerous fisheries which have been well exploited. Near the mouth are a number of canneries. Captain Gray of Boston entered the river in 1792, and Lewis and Clark explored it in 1805.

COLUMBIA CITY, Ind., county-seat of Whitley County, in the northeastern part of the State, situated on Blue Creek and on the Wabash and on the Pittsburgh, Fort W. and Ch. railroads. It has lumber mills and manufactures furniture, wagons, etc. Pop. 3,448.

COLUMBIA PLATEAU, a broad upland region lying in Washington, Oregon and Idaho. It averages about 3,500 feet in elevation, but is deeply trenched by Columbia and Snake River Canyons.. The plateau, which lies between the Rocky Mountains and the Cascades, consists of broad level expanses of Tertiary

COLUMBIA RIVER



CAPE HORN

lava flows. The southern part is a desert. In the north, particularly in the Big Bend country, considerable wheat is raised. The mineral wealth is very limited.

COLUMBIA RIVER HIGHWAY, a 60-mile scenic highway leading out of the city of Portland, Ore., to Hood River, and traversing the notably picturesque scenery along the Columbia River. The engineering work has been carried out with the most careful observance of artistic possibilities and effects, and the results are hailed as a model for similar enterprises. The roadway is 18 feet in width, of bitulithic pavement, and the steepest grade does not exceed 5 per cent. The highway joins the Lincoln Highway at Cheyenne and forms a link in the route through Yellowstone Park.

COLUMBIA SALMON. See QUINNAT.

COLUMBIA UNIVERSITY, a seat of learning in New York. The idea of establishing a college in New York was more than 50 years in contemplation before it was carried into effect. In 1746 provision was made by law for raising money by public lotteries. Five years later the proceeds of these lotteries amounted to about $1,700 and were given to trustees. The fact that two-thirds of these trustees were in communion with the Church of England and that some of them were vestrymen of Trinity Church excited opposition to the proposal as a scheme to strengthen the Established Church and delayed the procurement of a royal charter. Friends of the enterprise proceeded, however, with the arrangement for opening the college and elected for their first president the Rev. Dr. Samuel Johnson of Stratford, Conn., who assumed the office 17 July 1754, in the schoolhouse belonging to Trinity Church. There was a class of eight students.

The cosmopolitan character of the governing body of the college is due to its charter. To meet the objections that had been made, it was so drawn as to include in its board of governors, besides other ex officio representatives, not only the rector of Trinity Church, but the senior minister of the Reformed Protestant Dutch, Ancient Lutheran, French and Presbyterian churches. It is probably due to this circumstance that Columbia almost alone of all the pre-Revolutionary colleges in the United States has never had a theological faculty connected with it. The trustees, at present, are members of the Episcopal Church, and also of the Reformed, Presbyterian and Roman Catholic churches, showing that this cosmopolitan character has never been lost. A prominent Hebrew rabbi was at one time a member of its councils.

The charter of King's College, the original name of Columbia, was granted by George II, and finally passed the seals on 31 Oct. 1754, from which day the college dates its existence. It received from Trinity Church, according to a promise previously given, a portion of a grant of land known as «the King's Farm,» upon the site of which its first building was erected. It was stipulated in the royal charter that its president should be a communicant of the Episcopal Church and that proper selections from the liturgy of that church should be used in the religious services of the college. This caused much angry controversy, and after the Revolution it was stricken out of the charter, but remains as the condition of the deed of gift from Trinity Church. King's College played a conspicuous part in securing and confirming the independence of the United States. The Revolutionary War caused a suspension of the activities of the college, and in 1776 the college building was used as a military hospital. After eight years the college work was resumed by act of the legislature, 1 May 1784, under the name of Columbia College.

On 13 April 1787 the legislature revived the original charter with amendments, which abolished ex officio membership of its governing body, canceled the requirement that the president should hold a certain form of religious belief or that a certain form of prayer should be used in the services of the college, and named a body of 29 trustees, which, when reduced to 24 members, was made a self-perpetuating body, under which government the college has remained. The medical faculty was organized in 1792 and a professorship of law was established in 1793.

The original site of the college was in what became later the block bounded by College Place, Barclay, Church and Murray streets. In 1857 the college was moved to 49th and 50th streets and Madison avenue, where it remained until 1897. In 1892, for $2,000,000, purchase was made of 17½ acres of land lying between 116th and 120th streets, Amsterdam avenue and the boulevard. Here in 1897 the college was reorganized on the basis of a university.

Columbia University, in a technical sense, consists of the faculty of law, the first professor of which (1792), James Kent, during the period of his second appointment in 1823 delivered the courses of lectures which developed into the first two volumes of his famous 'Commentaries'; the faculties of medicine; philosophy, political science; pure science and applied science. The College of Physicians and Surgeons, the outcome of the medical faculty, established in King's College in 1767, became in June 1860 the Medical College of Columbia. In 1891 it surrendered its separate charter and became an integral part of Columbia College. A peculiarity of the Columbia organization is the system by which seniors in Columbia College, who have entered the college not later than the beginning of the junior year, are allowed to select part or all of the courses necessary for the bachelor's degree from among those designated by the university faculties, professional or non-professional, as open to them. The object of this arrangement is to shorten the time necessary to the attainment of the higher, particularly of the professional, degrees. The degree of master of laws is conferred for advanced work in law done under the faculties of law and political science together. The faculties of law, medicine and applied science conduct respectively the schools of law, medicine and mines, chemistry, engineering and architecture, to which students are admitted as candidates for professional degrees on terms prescribed by the faculties concerned. The school of mines was due to the exertions of Thomas Egleston, who was made professor of mineralogy and metallurgy in 1864, and who opened the school of mines the same year in the basement of the old college building in 49th street. There is also the school of chemistry, engineering and architecture, set off from the school of mines in 1896. Out of the school of mines grew the school of pure science, established in 1892. In 1912 a school of journalism was established and in 1916 a school of business. Under President Barnard's influence, in April 1889, the trustees gave their official approval to the plan for founding Barnard College for women studying for Columbia degrees. It is financially a separate corporation, but educationally it is part of the system of the university. Teachers' College, a professional school for teachers, is also financially a separate corporation and educationally a part of the university. It was founded in 1888, chartered in 1889 and included in the university in 1898. (See Colleges for Teachers). Some of these courses are accepted by Columbia University, and may be taken without extra charge, by students of the university in partial fulfilment of the requirements for the degrees of Bachelor of Arts, Master of Arts and Doctor of Philosophy. In 1914–15 the university had a total of 11,876 resident students in all departments, 3,305 extension students and 1,833 special students in Teachers' College, and its library comprised 550,000 bound volumes. The library building is a gift from ex-President Low, and cost over $1,000,000.

The Presidents of the University have been: Samuel Johnson (1754–63); Myles Cooper (1763–75); the Rev. Benjamin Moore (1775–76); William S. Johnson (1787–1800); Charles H. Wharton (1801); the Rt. Rev. Benjamin M. Moore (1801–11); William Harris (1811–29); William A. Duer (1829–42); Nathaniel Moore (1842–49); Charles King (1849–64); Frederick A. P. Barnard (1864–89); Henry Drisler, acting (1889–90); Seth Low (1890–1901); and Nicholas Murray Butler (inaugurated 1902).

COLUMBIA UNIVERSITY SCHOOL OF MINES. See Columbia University.

COLUMBIAN COLLEGE. See George Washington University, The.

COLUMBIAN FORMATION, a series of gravels, sands and clays of Pleistocene Age covering the coastal plain of the Atlantic slope from New Jersey southward and typically developed in the District of Columbia. The formation in the north covers the plain up to elevations of 400 feet, and in the south up to 100 feet. It includes estuarine and delta deposits, and the fossils are recent marine and terrestrial species, indicating a very slight submergence and re-elevation of the coast. The formation may correspond to the Champlain stage of the glaciated portion of the continent. See Champlain Stage; Glacial Period.

COLUMBIAN UNIVERSITY. See George Washington University, The.

COLUMBIAN WORLD'S FAIR. See World's Columbian Exposition.

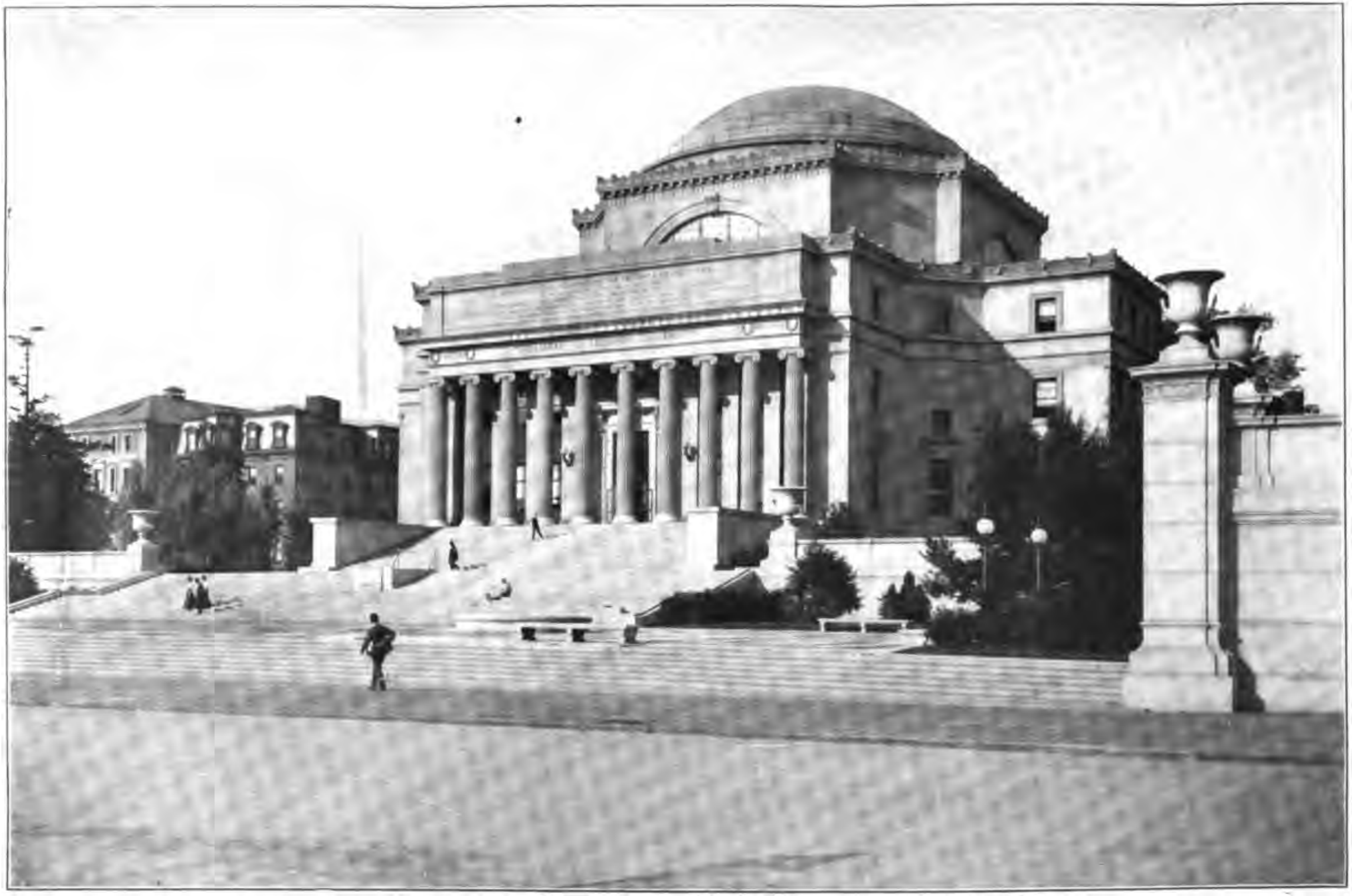
COLUMBIDÆ, kō-lŭm'bĭ-dē, the family of true pigeons, the typical one of the order *Columbæ,* of which it embraces the bulk of the known species, more than 300 belonging to this family of true pigeons and doves. Over half of them are found in the Malayan and Austro-Malayan Archipelago, and 75 in South and Central America, while all other parts of the world, except the polar regions, have their representative species in smaller numbers. Although our native species give but a faint idea of the richness of color and other peculiarities of adornment of the tropical pigeons, the structural features are remarkably constant and well exemplified in the domestic pigeon. The bill is moderate and compressed, having at its base a soft skin in which the nostrils are placed. The feet have three divided toes before and one behind, all of which are on the same level; the tarsi scutellate. The wings are rather long and exceptionally powerful; the plumage generally compact and the feathers without aftershafts. One of the most variable features is the tail, which may be short and square or long and pointed, and its rectrices from 12 to 16. Although classed by Cuvier with the gallinaceous birds, the *Columbidæ* differ from them in structure and especially in habits, being monogamous and good flyers. Besides they are unlike the domestic fowl which is the type of the *Gallinæ,* in that the males assist in nest-building and incubation and the young are not able to walk, and are nourished by the parent birds, which secrete in the double crop a milky fluid utilized to soften their food. Moreover the *Columbidæ* drink at a single draught. They eat seeds and berries, more rarely insects. See Dove; Pigeon; etc.

COLUMBINE, a popular name for *Aquilegia vulgaris* or other species of the genus *Aquilegia.* The common columbine has drooping purplish-blue flowers with five flat sepals; five petals, with long spurs, often curved; five follicles; the root-leaves twice or thrice ternate, the others once ternate. Numerous species of the genus occur in North America. *A. cærulea,* the Rocky Mountain columbine, with very large, sky-blue flowers, the showiest plant of the genus, is the State flower of Colorado.

COLUMBITE, a mineral of variable composition, consisting of a compound niobate (columbate) and tantalate of iron and manganese. When niobium is present in large amount relatively to the tantalum, the mineral is called «columbite,» and when the reverse is the case, it is called «tantalite»; the two minerals passing into each other, in nature, by insensible gradations. Typical columbite has a hardness of 6, and a specific gravity of from 5.4 to 5.8, the specific gravity increasing with the proportion of tantalum present. The crystals are short and prismatic, often tabular and belong to the orthorhombic system. The mineral is black or brownish-black in color and is often iridescent. In the United States columbite is known to occur in most of the States lying near the Appalachian Mountain system and also in Colorado, South Dakota and California. One crystalline mass of it, found in the Black Hills region, is said to have weighed about a ton. The existence of columbite in the United States was first made known through a specimen sent by Governor Winthrop of Connecticut to Sir Hans Sloane, president of the Royal Society of Great Britain.

COLUMBIUM, a metallic element, better known as niobium. It was discovered by Hatchett in 1801 and named columbium and rediscovered by H. Ross in 1846 who named it niobium. It is found in small quantities in various minerals; but principally in columbite and tantalite. Columbium has been found in various parts of the United States, Sweden,

COLUMBIA UNIVERSITY



LIBRARY BUILDING

Mexico and other Central and South American countries. It is a very hard metal, especially when combined with carbon, its normal condition. It was called niobium on account of its resemblance to tantalum with which it occurs. The allusion to the name is classical as Tantalus was the father of Niobe. Chemical symbol Nb; atomic weight 93.5. It is a brilliant metal of steel-gray color. Chemically it is akin to bismuth.

COLUMBO, the root of a climbing plant, *Jateorrhiza columba,* of the family *Menispermaceæ,* which grows in great profusion in the island of Mozambique. It is also called calumba. The root, sliced transversely into discs, is dried and used in medicine in the form of an infusion as an appetizer and tonic. It contains a bitter alkaloid, *berberine,* and another bitter principle, *columbin.* It is free from tannic acid, so, unlike most bitters, it may be mixed with the preparations of iron. It was formerly employed for diarrhœa, dysentery and gas in the bowels, being carried to India, whence it is exported.

COLUMBUS, Bartholomew (Sp. Bartolomeo Colón; It. Bartolommeo Colombo, his real name), Italian navigator, brother of Christopher Columbus: b. Genoa before 1455; d. San Domingo, 12 Aug. 1514. The events of his early years are not on record. In 1470 we find him established at Lisbon as a mariner and constructor of maps — one of those adventurous navigators whom the patronage of the Portuguese princes had drawn to their capital. About 1486 he visited the Cape of Good Hope, probably with Barthelemi Diaz. His brother sent him to England to seek the aid of Henry VII in 1488, but it appears certain that Christopher was ignorant of his fate, further than that he was captured by pirates. He did, however, attain the ear of the English monarch and presented him with a map of the world, but it does not appear that he succeeded in securing English aid. On his return to France, where he became cartographer to Anne de Bourbon (de Beaujeu), he learned that his brother had already discovered the new world and had sailed on a second voyage (1493). Hastening to the Spanish court, he was received as became the brother of the admiral. Queen Isabella sent him in command of three store ships to the new colony of Hispaniola (1494) where Christopher received him with joy and appointed him adelantado or lieutenant-governor of the Indies. In this position Bartolommeo showed great bravery and decision. He shared his brother's imprisonment, and with him was liberated on reaching Spain, where the Spanish monarchs confirmed his title and gave him the lordship of the small island of Mona near San Domingo, with 200 Indians as his personal body-guard. The fierce energy of his character, however, made them jealous of giving him too much latitude in public affairs.

COLUMBUS, Christopher (Sp. Cristóbal Colón; It. Cristoforo Colombo, his real name), Italian navigator, the discoverer of America: b. Genoa probably 1451; d. Valladolid, Spain, 20 May 1506. His father, Domenico Colombo, a poor weaver, gave him a a careful education in that trade — better characterized as an industrial art or handicraft, highly regarded in Italy during the 15th century, and indeed with good reason esteemed long before and long after the very noble Quattrocento. (See Professor Venturi's account of the Quattrocento or 14th century, in the article Italy — Historical Synopsis of Italian Art). The details of his early life are confused and unsatisfactory. The date of his birth has never been definitely established; different historians range between 1430 and 1456, those most often given being 1436 and 1446. Judging from the ages of his younger brother (b. 1468) and his still younger sister, the year 1451 given above seems the most likely estimate. He is shown by documents cited by Henry Vignaud to have sailed to Chios when about 23 or 24 years of age. Again, in 1476, he sailed for England, and about one year later engaged in commerce at Lisbon. There he married Felipa Moñiz Perestrello, a daughter of a distinguished navigator who had founded a colony in Porto Santo, an island recently discovered and belonging to the Madeira group, and had left many charts and nautical instruments. Columbus made use of these materials, and his opinion that the other side of the globe contained land, belonging to eastern Asia and connected with India, which was, as yet, little known, became more and more fixed. While the Portuguese were seeking to reach India by a southeast course round Africa, he was convinced that there must be a shorter way by the west. He applied in vain to Genoa for assistance, and equally fruitless were his endeavors to interest John II of Portugal in the enterprise. He also sent letters on the subject to Henry VII of England, with the same ill success. He then determined to apply to the Spanish court, Ferdinand and Isabella being at this time the sovereigns of Spain, and after an eight years' struggle with the obstacles thrown in his way by ignorance and malice, he received three small vessels. These were named the *Pinta,* the *Niña* and the *Santa María;* and the documents show the complement of men to have been, for the crews 90, officers and all others 30, total 120. The Capitulations of Granada provided that, after successful accomplishment and conclusion of the adventure — not before — its leader should be advanced to the dignities and offices of peer, admiral and viceroy of such regions as he should or might discover and take possession of — «certain islands in the sea of whose existence Columbus knew.» No reference to the Indies appears in records of the negotiations for this great voyage.

It was early in the morning of Friday, on 3 Aug. 1492, that Columbus set sail from the port of Palos. Eighteen years had elapsed since he had first conceived the idea of this enterprise. The most of that time had been passed in almost hopeless solicitation, amidst poverty, neglect and ridicule; the prime of his life wasted in the struggle. Nor should it be forgotten that it was to Isabella alone that he was finally indebted for the means of executing his project, which had been coldly rejected by the prudent Ferdinand. Having provided himself at the Canary Islands with fresh water, he sailed at first due west but later southwest into an ocean never before navigated. But when 21 days had elapsed without the sight of any land, the courage of his men began to sink. It was certain, they said, that they should perish, and their visionary commander ought to be forced to return. Some of them even proposed to throw him overboard; and Columbus had to exert all the powers of his daring and commanding spirit to quell the mutiny. It seems clear that his triumph in this crisis was due in part to Pinzón's able and loyal assistance. A phenomenon, which surprised even him, filled his pilots with consternation: the needle deviated a whole degree. But the sea appeared suddenly covered with grass, and again showed symptoms of shoals and rocks. Numbers of birds were also seen. Columbus sailed in the direction from which they flew. For some days the voyage was continued with revived courage, until at last the dissatisfaction of the crews began again to break out into open violence; but Columbus, after endeavoring in vain to pacify his men by promises, finally assumed a different tone, and told them it was useless to murmur; that he was determined to persevere. Fully convinced that he must be near the land, he promised a reward to the man who should first catch sight of it. On the night of 11 and 12 October Columbus himself descried a light which sometimes flickered in the distance and sometimes disappeared, and at two o'clock on the morning of the 12th a cannon shot from the *Pinta* announced that a sailor belonging to that vessel had sighted land. That sailor was Rodrigo de Triana.

It was the island of Guanahani, which Columbus believed to belong to eastern Asia, the Indies or India, a belief which he carried with him to his grave. Hence the mistaken names of Indians applied to the natives of America, and that of West Indies applied to the group of islands of which Guanahani forms one. On landing Columbus threw himself upon his knees and kissed the earth, returning thanks to God. The natives collected round him in silent astonishment, and his men, ashamed of their disobedience and distrust, threw themselves at his feet, begging his forgiveness. Columbus, drawing his sword, planted the royal standard, and in the name of his sovereigns took possession of the country, which, in memory of his preservation, he called San Salvador. He then received the homage of his followers, as admiral and viceroy, and representative of the sovereigns. Being informed by the natives that there was a rich gold country toward the south, Columbus directed his course toward that region, and reached Cuba on 28 October, and Española (Hispaniola, Haiti), on 6 December; but as one of his vessels was wrecked and the other separated from him, he resolved to carry the news of his success to Spain. Having built a wooden fort from the wreck of his vessel, he left in it 39 volunteers, and set out on his return, 4 Jan. 1493. The day after he left the island he met the *Pinta,* which had been missing. Both vessels were afterward nearly wrecked in a tremendous storm. Columbus, more interested for his discovery than for himself, wrote an account of his voyage on a piece of parchment, which he secured in a cask, and threw the whole overboard, in the hope that it might be carried ashore. He had hardly finished his work when the gale subsided. On 15 March he re-entered the port of Palos amid the acclamations of the people, the thunder of cannon and the ringing of bells. He hastened immediately to Barcelona, where the court then was, and entered the city in a triumphal procession, with the productions of the newly discovered countries carried before him. A chair was placed for him next to the throne, and, seating himself, he gave an account of his discoveries. He was created a grandee, and all the marks of royal favor were lavished upon him.

On 25 Sept. 1493, he set sail from Cadiz with three large ships of heavy burden and 14 caravels, carrying 1,500 men. On 3 November he discovered the island of Dominica, and afterward Maria Galante, Guadeloupe and Porto Rico, and on the 22d arrived at Hispaniola. Finding the colony he had left destroyed, he built a fortified town, which he called, in honor of the queen, Isabella, and of which he appointed his brother Diego governor. He immediately left the island in order to make new discoveries, visited Jamaica, and returning after a voyage of five months, worn down with fatigue, found to his great joy that his brother Bartolommeo, who had escaped from his captivity, had arrived at Isabella with provisions and other supplies for the colony. Meanwhile a general dissatisfaction had broken out among his companions, who, instead of the expected treasures, had found hardships and labor. They set on foot many calumnies and gave the most unfavorable description of the country and the viceroy. Columbus thought he could not better oppose these reports than by sending considerable treasures to his sovereigns, and for this purpose collected gold from the natives, which was not done without violence and some cruelty. Aguado, a personal enemy of Columbus, was sent as commissioner to investigate the complaints against the great discoverer, who, thinking it time to vindicate himself in the presence of his sovereigns, prepared to return to Spain. Having appointed his brother Bartolommeo adelantado or lieutenant-governor, he embarked for Spain in March 1496 with 225 Spaniards and 30 natives. In Spain calumny was silenced by his presence, and probably still more by his treasures. Yet his enemies were powerful enough to detain the supplies intended for the colony a whole year, and to retard the fitting out of a new expedition.

It was not till 30 May 1498, that he sailed with six vessels on his third voyage. To man these vessels criminals had unwisely been taken —a measure which Columbus himself had advised, and which had been taken up with great satisfaction by his enemies. Three of his vessels he sent direct to Hispaniola; with the three others he took a more southerly direction, for the purpose of discovering the mainland, which information derived from the natives induced him to suppose lay to the south of his former discoveries. He visited Trinidad and the continent of America, the coasts of Paria and Cumana, and returned to Hispaniola, convinced that he had reached a continent. His colony had been removed from Isabella, according to his orders, to the other side of the island, and a new fortress erected called San Domingo. Columbus found the colony in a state of confusion. After having restored tranquillity by his prudent measures, in order to supply the deficiency of laborers he distributed the land and the inhabitants, subjecting the latter to the arbitrary will of their masters, and thus laying the foundation of that system of slavery which has lasted down to our time. His enemies, in

CHRISTOPHER COLUMBUS

the meantime, endeavored to convince his sovereigns that he had abused his power, and that his plan was to make himself independent, till at last even Isabella yielded to the wishes of Ferdinand, who had previously become convinced of the truth of the slanders. Francisco de Bobadilla was sent to Hispaniola with extensive powers to call the viceroy to account. As soon as he reached the island he summoned Columbus to appear before him and put him in irons. His brothers were treated in the same manner. All three were sent to Spain, accompanied by a number of written charges, drawn up from the statements of the bitterest enemies of Columbus. Columbus endured this outrage with noble equanimity, and wrote, as soon as he had arrived in Cadiz, 25 Nov. 1500, to a lady of the court vindicating his conduct, and describing in eloquent and touching language the treatment he had received. The fetters with which he had been bound he kept to the day of his death, and his son Hernando states that he even ordered that they should be enclosed with him in his coffin. Orders were immediately sent directing him to be set at liberty, and inviting him to court, where his sovereigns received him with the same distinction as formerly. Isabella was moved to tears, and Columbus, overcome by his long-suppressed feelings, threw himself upon his knees, and for some time could not utter a word for the violence of his tears and sobbings. He then defended himself by a simple account of his conduct, and was reinstated in his dignities. Ferdinand even consented to dismiss Bobadilla, which was intended for the first step toward the promised restoration of the great discoverer to his dignities. But these dispositions in the monarchs were soon changed. There was much talk of great expeditions, and in the meantime Nicolas de Ovando y Lares was sent as governor to Hispaniola. Columbus still urged the fulfilment of the promises solemnly made to him; but after two years of delay he became convinced that there was no intention to do him justice.

But he had now learned to suffer, and he was principally desirous of completing his work. Supposing the continent which he had seen to be Asia, he did not doubt that he should find, through the Isthmus of Darien, a way to the Spice Islands, from which the first fleet of the Portuguese had just returned richly laden. In four slender vessels supplied by the court for this purpose Columbus sailed from Cadiz on his fourth and last voyage, 9 May 1502, with his brother Bartolommeo and his son Hernando; arrived contrary to his original intention off San Domingo 29 June, and was denied permission to enter the port for the purpose of refitting his vessels, and escaping an approaching storm. He succeeded, however, in anchoring his small squadron in a place of safety, and rode out the storm, while a fleet of 18 vessels, which had put to sea in spite of his warning, was almost entirely destroyed. He then continued his voyage to Darien, but without finding the expected passage. Two of his vessels were destroyed by a gale; the two others were wrecked off Jamaica, where he was scarcely able to save himself and his companions. Here the severest trials awaited the constancy of Columbus. Separated from the other part of the world, his destruction seemed to be certain. But he succeeded in procuring a few canoes from the natives, and prevailed on some of his boldest and best men to attempt a voyage to Hispaniola, in two canoes, in order to inform the governor of his situation. Several months elapsed without a glimpse of hope. Part of his companions, reduced to despair, rebelled, repeatedly threatened his life, separated from him and settled on another part of the island. Here they alienated the minds of the natives by such cruel treatment, that the latter ceased to bring them supplies. The death of all seemed inevitable; but Columbus, whose courage rose with the danger, preserved his men in this crisis. He had ascertained that a total eclipse of the moon was about to take place, and threatened the natives with the vengeance of his God if they should persist in their enmity. As a proof of his assertion the moon, he said, would lose its light, in token of the chastisement which awaited them. When they beheld his threat verified they hastened to bring him provisions, and implore his intercession with the Deity. But hostilities now broke out between him and the rebels, in which several of the latter were killed, and their leader was taken prisoner. After remaining a year on the island, relief at last appeared. The two canoes had reached Hispaniola in safety, but the messengers could not prevail on the governor to undertake the deliverance of the admiral. They finally bought a vessel themselves, and it was on board this ship that Columbus left Jamaica, 28 June 1504. He went to San Domingo, but only to repair his vessel, and then hastened back to Spain. He arrived in Spain ill and exhausted. The death of the queen soon followed, and he urged in vain on Ferdinand the fulfilment of his contract. After two years of illness, humiliations and despondency, Columbus died at Valladolid. His remains were transported, according to his will, to the city of San Domingo, but on the cession of Hispaniola to the French they were removed in January 1796, with great pomp, to the cathedral of Havana in Cuba. A splendid monument was erected to him, in a convent at Seville, where his body lay before being transferred to San Domingo. In 1898 his remains were again removed to Spain, Cuba being no longer a Spanish possession since the war with the United States.

In the vigor of manhood Columbus was, according to tradition, of an engaging presence, tall, well formed and muscular, and of an elevated and dignified demeanor. His visage (here also we can be guided only by tradition and relatively late portraits, inasmuch as an authentic contemporaneous portrait probably does not exist) was long, his nose aquiline, his eyes light gray and apt to kindle. His whole countenance had an air of authority. Care and trouble had turned his hair white at 30 years of age. He was moderate and simple in diet and apparel, eloquent in discourse, engaging and affable with strangers, and of great amiability and suavity in domestic life. His temper was naturally irritable, but he subdued it by the benevolence and generosity of his heart. Throughout his life he was noted for a strict attention to the offices of religion; nor did his piety consist in mere forms, but partook of that lofty and solemn enthusiasm with which his whole character was strongly tinctured. Of a great and inventive genius, a lofty and noble ambition, his conduct was characterized by the grandeur of his views and the magnanimity of his spirit.

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COLUMBUS, Diego, or Giacomo (It. Giacomo Colombo), Italian voyager: b. Genoa about 1446; d. at Seville, 21 Feb. 1515. He was a brother of Christopher Columbus, whom he accompanied on the second voyage to America, in 1493. He was sometimes left in command at the settlements of Isabella and San Domingo and returning to Spain in 1500, subsequently entered the priesthood.

COLUMBUS, Diego (Sp. Colón, kō-lōn'): b. probably at Lisbon about 1476; d. Montalvan, near Toledo, Spain, 23 Feb. 1526. He was a son of Christopher Columbus (q.v.) and from 1492 to 1504 was a page at the Spanish court. In 1508 he married into the famous and influential Alba family and through his wife's influence he was confirmed admiral of the Indies and governor of Hispaniola in 1509, where he ruled with great pomp and splendor. Throughout his life he continued his claim to the office of viceroy of the Indies which had been conferred upon his father; and this kept him in a constant legal battle in which his opponents generally got the better of the fight, until 1520 when he finally won the contest; only, however, to hold his hardly won prize until 1523, when he was summoned back to Spain, where he died three years later.

COLUMBUS, Ferdinand (Sp. Ferdinando Colón, fĕr-dē-nän'dō kō-lōn'), Spanish voyager: b. Cordova, Spain, 15 Aug. 1488; d. Seville, 12 July 1539. He was a son of Christopher Columbus, whom he accompanied on his fourth voyage 1502–04. His library of 20,000 books was bequeathed to the cathedral chapter of Seville and was known as the "Columbina." But 4,000 of these now remain and the history of the Indies by him is also lost, as well as the original Spanish of his life of his father, largely drawn upon by Las Casas. This is the basis of the majority of the 'Lives' of Columbus.

COLUMBUS, Luis, loo-ēs' (Sp. Colón), Spanish noble: b. San Domingo 1521 or 1522; d. Oran, Africa, 3 Feb. 1572. He was a son of Diego Columbus 2d (q.v.), and a grandson of Christopher Columbus. He was given the title of admiral of the Indies, but in 1530 was obliged to relinquish the title of viceroy, receiving in exchange the island of Jamaica, an estate 25 leagues square in Veragua, a pension of 10,000 ducats and the titles of Duke of Veragua and Marquis of Jamaica. He was captain-general of Hispaniola 1542–51. Arrested in 1559 for having three wives, he was imprisoned for three years and then banished to Africa. Felipa, his daughter, married her counsin, Diego, who then became Duke of Veragua, but dying childless in 1518 the family of Columbus then became extinct in the male line. The present Duke of Veragua (b. 1857) traces his descent from Columbus through Diego, Cristobal, Diego's son, and Francesca, the daughter of Cristobal and sister of Diego Columbus, who died in 1578.

COLUMBUS, Ga., city and county-seat of Muscogee County, 95 miles southwest of Atlanta, on the Chattahoochee River and on the Seaboard Air Line, the Southern and the Central of Georgia railroads. It is at the head of navigation on the river and steamboat service is maintained with Apalachicola, Fla. Columbus is the centre of a rural territory which is a large producer of beef and dairy cattle, live stock and hogs, peanuts, corn, oats, wheat, etc. The city's manufacturing industries have earned for it the title of the "Lowell of the South" and are operated mostly by hydro-electric power, of which the river at this point is capable of furnishing about 60,000 horse-power, 20,000 of which has been developed. The city has cotton and hosiery mills, lumber and building material plants, agricultural implement plants, iron and steel mills, bottling plants, fertilizer factories, flour and grist mills, cotton-seed oil mills, peanut factories, showcase and fixture manufactories, brick and sewer-pipe works, and barrel factories. About $20,000,000 is invested in the city's industries and the value of the output is approximately $16,000,000 annually. The city contains an industrial school, three national banks, two exclusive savings banks and fine State banking institutions, and in addition the usual quota of churches, clubs, libraries, etc. The waterworks are controlled by the city. Columbus was settled in 1828 and incorporated the year following. In the Civil War the city was an important supply depot of the Confederates and a vast quantity of supplies for the Southern armies was manufactured here. On 16 April 1865, the city fell into the hands of the Federals. Pop. (1910) 20,554; (1917) about 25,000.

COLUMBUS, Ind., county-seat of Bartholomew County, in the southern central part of the State, situated on a fork of the White River and on the Cleveland, C., Ch. & Saint Louis and the Pittsburgh, C., Ch. & Saint Louis railroads. It has large manufactories of cerealine, agricultural implements and furniture, starch and flour mills and gasoline engines. Pop. 8,813.

COLUMBUS, Kans., city and county-seat of Cherokee County, 55 miles south of Fort Scott, on the Missouri, Kansas and Texas, the Saint Louis and San Francisco and the Joplin and Pittsburgh railroads. The region is rich in coal, lead, zinc and farm products, in all of which the city has large interests. It contains flour mills, grain elevators, a cigar factory, bottle works, canning factory, machine shops and large brickyards. Natural gas also is found in the district. The city has a high school, a public library and owns the waterworks. Pop. 3,064.

COLUMBUS, Miss., county-seat of Lowndes County, situated on the Tombigbee River and on the Mobile and Ohio and the Southern railroads, 150 miles southeast of Memphis and the same distance northeast of Jackson. It is the farming trade centre of the country, and has a large cotton-mill, machine shops and lumber mills. The United States census of manufactures for 1914 reported 27 industrial establishments of factory grade, employing 636 persons; of whom 521 were wage earners. The capital invested aggregated $984,000, and the year's output was valued at $1,249,000: of this, $502,000 was the value added by manufacture. It is the seat of the State Industrial Institute and College for girls and of Franklin Academy. The value of its taxable property is about $7,800,000. Pop. 10,053.

COLUMBUS, Neb., county-seat of Platte County, in the eastern part of the State, situated on the Loup River, near the Platte and on the Union Pacific and the Burlington & M. railroads. It is the seat of a Roman Catholic academy and has flour mills, a brewery, a wooden-shoe factory and a roller mill. In the vicinity are some Indian mounds of scientific interest. Pop. 5,014.

COLUMBUS, Ohio, the capital of the State and the county-seat of Franklin County, is located on a plateau about 800 feet above sea-level, in the geographical centre of the State, and practically in the centre of the population of the United States, in lat. 39° 57′ 41″ N. and long. 82° 59′ 46″ W. It is 120 miles northeast of Cincinnati and 135 miles southwest of Cleveland, at the junction of the Scioto and the Olentangy rivers. Eighteen steam railroads, including the C. H. V. & T. and the P. C. C. & Saint L., radiate from Columbus to all parts of the State, intersecting all through lines running East, West, Northeast, Northwest and South, and there are besides eight electric interurban traction lines in operation.

Area, Parks, Streets and Squares.— The area of the present city is 22.362 square miles. It is laid out on the same scale and plan as Washington, and in general outline resembles a Maltese cross. It has an area of 280 acres in public parks, 100 acres in other parks and 952 acres in public grounds, and the fine system of parks and boulevards is being steadily enlarged. The Ohio State fair grounds of over 100 acres are just outside the city limits. There are 252 miles of paved streets, about 65 miles of which are asphalt, within the city confines, the main thoroughfares lighted by a system of electric cluster standards. The longest streets are High street and Broad street, which run north and south and east and west respectively. The uniform width of the former is 100 feet, its length about eight miles; the breadth of the latter is 120 feet; its length 7.13 miles. Broad street is planted with four rows of shade trees for its entire length east of the Capitol Square, where it penetrates the fashionable residence district. Here are many beautiful homes and fine mansions. High street is the leading business thoroughfare, and on this and on the other business streets are situated many steel, brick and stone office buildings from 8 to 16 stories high. Capitol Square, a miniature park of 10 acres, is situated at the intersection of High and Broad streets, two squares east of the Scioto River. At the main entrance is the McKinley Memorial (modeled by H. A. McNeill), and northwest of the Capitol buildings is a group of statues of famous men known as «Ohio's Jewels.»

Public Buildings.— The first State House was of brick and cost $85,000; the present massive buildings and additions are of dressed native gray limestone, in the Doric style of architecture. They cover nearly three acres and their total cost has been $2,500,000. Among other public buildings of interest are the new Federal Building, Memorial Hall and Auditorium, the Athenæum, city hall, post-office, chamber of commerce, union station, Y. M. C. A. building, the opera house, athletic club and Elks club. There are 59 hotels, including the new Deshler Hotel erected at a cost of $2,000,000, six theatres and five auditoriums with a combined seating capacity of 40,000.

Public Institutions.— Columbus is the location of the State Hospital for the Insane, of State institutions for deaf-mutes, blind and imbecile youth, and has 12 general hospitals besides a number of private sanatoria. The Ohio State Penitentiary, in which Morgan and his raiders were imprisoned during the Civil War, is one of the oldest and most famous in the country. A United States pension office and the Columbus barracks, the largest interior military recruiting station in the United States, are also situated at Columbus.

Schools and Churches.— There are 59 public school buildings in the city, six being devoted to high school purposes, with an average attendance of 29,000, the high schools having

2,300. The churches number 175, with an active church membership of about 75,000.

Educational Institutions.—Chief among the institutions for higher education is the Ohio State University, with a campus of 440 acres, 38 buildings valued at $6,500,000, and a student body of nearly 7,000. There are, besides, the Capital City University, the Josephinum College and Saint Mary of the Springs (both Catholic), and a number of other religious and private educational institutions. The professional schools include one dental and two medical colleges, a law school, a school of oratory and music, school of art and the Bliss Business College. The city has also seven public libraries with over 3,000,000 volumes.

Trade and Industry.— Prominent business interests of the city are represented by 7 national and 20 private banks, trust companies, savings and building and loan associations, with clearings amounting in 1917 to $525,641,400. Besides its other important commercial and manufacturing interests, Columbus is a great distributing centre for hot-house fruits, vegetables, lumber, coal, iron and steel. It has 900 manufactories (including those just outside the city limits), with an approximate annual product of $95,000,000. Seven of these are the largest industrial concerns of their kind in the world, and produce mine and mill machinery, electrical machinery, trucks, wheelbarrows, shoes, butterine, regalias, uniforms, dental supplies, drugs and patent medicines, agricultural implements and vehicles. There are also steel plants, blast-furnaces, malleable iron works and manufactories of steel, iron and wood products, beer and liquors, cash registers, watches, furniture, agricultural implements, mine, mill and farm supplies, cloth fabrics, gloves, hosiery, clothing, automobiles, novelties, specialties and general merchandise. The United States census of manufactures for 1914 reported 643 industrial establishments of factory grade within the city limits, employing 21,323 persons; of whom 17,236 were wage earners receiving a total of $11,177,000 annually in wages. The capital invested aggregated $52,098,000, and the year's output was valued at $57,698,000: of this, $26,972,000 was the value added by manufacture.

Finances.— In 1917 the assessed property valuation was $305,423,900; the revenue from taxation for the city was $2,001,635; for schools, $1,878,623.

Newspapers, etc.— The newspapers and periodicals include four English and one German dailies, and about 20 papers and periodicals devoted to special interests.

Sewerage, Waterworks, etc.— The city has over 358 miles of sewers and owns a sewerage disposal plant costing $1,200,000, and a garbage disposal plant costing $500,000. There is a model waterworks system, costing $1,500,000, which includes a storage dam establishing a reservoir seven miles in length, and a purification and softening plant. The electric light plants are also owned by the municipality. Natural gas is the principal fuel for domestic use, and bituminous coal is found in unlimited quantities a few miles south of Columbus.

Government.— Under a new charter submitted in May 1914, and which became effective 1 Jan. 1916, the government of the city is vested in a mayor and council of seven members, elected at large every four years. It is a modified federal form and contains several progressive features, such as non-partisan ballot, preferential voting, referendum and recall.

History.— Columbus was made the capital by the legislature in 1812 and became the permanent capital in 1816, the original Territorial and State capital having been Chillicothe. In the same year it was incorporated as a village, and was chartered as a city in 1834.

Population.— Three-fourths of the population are native born. The largest foreign elements are German, Irish, Welsh, English and Italian. Since 1880, when it had 52,194 inhabitants, Columbus has grown rapidly. In 1910 it had a population of 125,650; in 1910, 181,511; in 1916, it was estimated at 211,021, inside the city limits. Metropolitan Columbus, including contiguous suburbs, in 1917 had over 260,000 inhabitants.

C. E. Dittmer,
Editor of City Bulletin.

COLUMBUS, Tex., county-seat of Colorado County, situated on the Colorado River and on the Southern P. Railway. Its chief industry is its cotton trade. It is the seat of Colorado College. Pop. about 1,800.

COLUMBUS, Wis., city of Columbia County, 65 miles southeast of Milwaukee, on the Little Crawfish River, and on the Chicago, Milwaukee and Saint Paul Railroad. It contains a public library, Saint Mary's Hospital and a county normal school. It has a flour mill, canning factories, carriage and wagon works and has a good trade in agricultural products and live stock. Pop. 2,600.

COLUMBUS, Knights of. See Knights of Columbus.

COLUMBUS BARRACKS. See Columbus, Ohio.

COLUMELLA, Lucius Junius Moderatus, Roman practical writer on agriculture: b. Cadiz, Spain. He flourished about the middle of the 1st century, and wrote 12 books on gardening ('De Re Rustica'), one of which was a metrical combination of the Georgics of Virgil. He treats in this work of all the branches of agriculture. The earlier editions of this work contain also his treatise 'De Arboribus,' in one book. According to Pliny, Columella wrote a work on ancient sacrifices for obtaining the fruits of the earth, but this is lost. The *editio princeps*, printed in folio by Jenson at Venice, in 1472, and forming part of a collection of 'Rei Rusticæ Scriptores varii,' is very rare. The most complete edition is contained in the 'Scriptores Rei Rusticæ' of Schneider (1794–97). Consult Barbaret, 'De Columellæ Vita et Scriptis' (Nancy 1888); Becher, 'De Columellæ Vita et Scriptis' (Leipzig 1897).

COLUMN (Latin, *columna*), *in architecture*, a supporting pillar, usually round. In the earliest times the column was merely a tree-trunk, or its imitation in stone, used to support the roof. The original sense of the word is something that is high or rises in height. The root of the word survives in "Colonel" and the French "colline," hill. The gods of nature were originally worshipped in certain places they were supposed to haunt, in the woods. The first temples were rude shelters in which the trunks of the trees of the forest, the "high things" were imitated. Hence, the first columns were of wood, being merely trunks of trees, and nearly all the existing primitive columns are round. The parts of a complete column are its base, on which it rests; its body, called the shaft; and its head, called the capital. Columns are used to support the entablature of an order, which has also its proper division. In countries like Egypt, where timber fit for construction is scarce and stone abundant, the latter became the principal material for columns, and those of Egypt are remarkable for the beauty of their workmanship and the durability of their materials. The Egyptian columns were numerous, close, short and very large. They were generally without bases, and had a great variety of capitals, from a simple square block ornamented with hieroglyphics, or faces, to an elaborate composition of palm leaves, not unlike the Corinthian capital. The Greeks, for their columns, used marble of the finest kind, with which their country abounded; and other nations the stone or material of their country. The Greeks considered the column as an essential part of the architecture of their temples, and never used it as a mere decoration. In fact the primitive Greek temples were little else than roofed columns, thus showing clearly their origin.

The manner of constructing the columns of all the orders rests on similar principles. They are all divided into three primary parts or divisions, the base, the shaft and the capital, except the Doric order, which has no base. The lowest or thickest part of the shaft is used by architects as the universal scale or standard whence all the measures which regulate and determine heights and projections are taken; and this standard or scale must be understood before any architectural design can be commenced. The universal architectural scale is called a diameter, and is the diameter of the lowest or the largest part of the column; and, unlike the foot, inch or yard, is as various as the size of columns. By the diameter, of course, is meant that of the circle which forms the bottom of the column. Half of this diameter, or the length of the radius which forms the circle, is called a module, and is used as well as the diameter as a primary standard of mensuration by some writers upon architecture. These measures of length are subdivided as follows, namely: the diameter into 60 parts, and the module into 30 parts, called a minute. The Ionic column has a base peculiar to itself called the Attic, which, with that of the Corinthian order, is described under ARCHITECTURE.

The shafts of the orders differ in height and even in various examples of the same order. The capitals also are as various. Columns are either plain or fluted, and the flutes and manner of dividing them are different in the Doric and Corinthian orders. The Ionic flutes much resemble the Corinthian, and in many instances are exactly similar. Columns of all the orders taper gradually toward the top, but in the middle there is sometimes a slight swelling called an entasis. Roman architecture being derived from the Greek, Roman columns were either exactly similar to Greek or modifications of the latter. The principal modifications of the column made by the Romans were that form of the Ionic capital in which there were four pairs of diagonal volutes instead of two pairs of parallel ones, and that peculiar to the Composite order, in which the capital of the Corinthian column was combined with that of the diagonal or modern Ionic.

Columns are also often used for commemorative purposes as well as for architectural supports; and such are the Trajan and Antonine columns in Rome, and the Monument in London, erected in commemoration of the great conflagration of 1666, one of the loftiest, best constructed and most beautiful in existence. It is a Doric fluted column, 202 feet high from the bottom of the pedestal, which is ornamented with bas-reliefs of Charles II and his court giving protection to the fallen city, and various inscriptions, to the top of the vase of flames, by which it is surmounted.

COLUMN, *in military tactics,* a formation in which the units (soldiers, squads, sections, platoons, companies, troops, squadrons or battalions) are arranged from front to rear, or in general any formation with relatively great depth and a narrow front. Columns are found in different forms both in close and in extended order. In close order they may be divided into those that are purely drill formations and those that are march formations. The drill-formation columns may be open, when the distance between two successive units permits wheeling or turning into line, or close, when this is not possible. The units of which close columns are formed are companies in America, platoons in Great Britain. Double columns are used by several countries.

The marching formation of infantry in America is the column of squads, in which the change from line into column is made by the bodily turning of the squad, a body two men deep and four men wide, under the command of a corporal. Germany has a similar formation, but provides for a place for the officers, sergeants and other file-closers in the column, and not merely beside it. Great Britain and most other countries form the column from the line and vice-versa without a bodily shifting of distinct units. The change from line to column is accomplished in Great Britain by the command "Form-Fours!", on which odd numbers front and rear stand fast, and even numbers step to the rear and right. In France the minor units of the column of route are drawn up side by side; the section, under the command of a subaltern or adjutant, consists of four parallel squads in single file, which open up fan-wise in deploying into line. Column of twos or fours is the universal cavalry marching formation; column of sections is that of artillery.

In open order lines of small columns are used by infantry to gain ease of movement through brush and security from fire, especially on reverse slopes. They are also far easier to manœuvre than lines. In the American army, these columns are either squad columns, in single file, under a corporal, or platoon columns, in double file, under a sergeant or subaltern. In the French army, a section deploys into squad columns by the mere lateral separation of its squads. The French often arrange their squad columns in two echelons.

The principle of the column formation, that of echelonment in depth, is emphasized strongly by the French in actual fighting tactics. It enables one to secure that the reinforcement of a depleted body of troops shall come from its own organization, and that as little confusion of command as possible shall result.

The term "column" is also used of the supply, ammunition, engineer and sanitary trains in the line of communication. These start from a rail-head or water-head, and turn over their supplies, etc., to the trains proper or take up wounded at refilling or distributing points.

Consult Balck, 'Tactics' (tr. Fort Leavenworth 1915); United States Small Arms Firing Manual; Infantry Drill Regulations; Cavalry Drill Regulations; Field Artillery Drill Regulations; Field Service Regulations. See also ARTILLERY; CAVALRY; INFANTRY; LINE; TACTICS.

COLUMN OF JULY, a monument erected in Paris in 1840, on the site of the old Bastile in honor of the citizens killed in the revolution of 1830. It is a shaft of bronze on a marble base, capped with a gilded statue of the Genius of Liberty. It is 154 feet high and 13 feet in diameter.

COLUMN OF SAINT MARK. See VENICE.

COLUMN OF TRAJAN, a monument erected in Rome in 114 A.D. in honor of the emperor. It is a Roman Doric column of white marble of 34 blocks, 23 composing the shaft, on which are carved representations of various scenes in Trajan's campaigns, containing 2,500 figures of men, each about two feet in height. The quadrilateral pedestal bears an inscription which can easily be read. It is 127⅓ feet high, exclusive of the statue of Saint Peter, which now stands on the apex of the column, having taken the place of the colossal figure of Trajan in 1587.

COLUMN VENDOME, vŏṅ-dōm, a monument erected in the Place Vendome, Paris, by Napoleon I, to commemorate the victories of the Grand Army over the Russians and Austrians in 1805. It is similar in design and ornamentation to the Column of Trajan, but is built of masonry encased in bronze taken from 1,200 captured guns, and capped by the statue of Napoleon. It is 142 feet high and 13 feet in diameter. It was overthrown in 1871 during the Commune but was restored in 1875.

COLUMNAR JOINTING, and COLUMNAR BASALTS. In lava flows (q.v.) and sills (q.v.) there is often manifested a peculiar structure consisting of five or six sided prisms or columns, separated by narrow cracks. These are usually at right angles to the cooling surface of the igneous mass. The cause is supposed to be contraction during cooling. Such columnar jointing is well displayed in the Giants Causeway (q.v.), at Fingals Cave (q.v.), along the Palisades of the Hudson (q.v.), in Yellowstone Park (q.v.) and at numerous other points.

COLURE, kō-lūr′, one of two imaginary great circles of the celestial sphere passing through the celestial poles; one passing through the equinoctial point of Aries and Libra and the pole of the equator; and the other through the solstitial points of Cancer and Capricorn, and the poles both of the ecliptic and equator. For this reason the first is called the equinoctial, and the second the solstitial colure. The name, meaning "docked" or "dock-tailed," is now rarely used; it was originally applied because a portion of these circles is always concealed under the horizon.

COLVILLE, SIR Edwin Henry, English general: b. 10 July 1852; d. 1907. He was educated at Eton and entered the grenadier service in 1870. He served in Egypt, the Sudan, Uganda and South Africa, where his failures led to his recall. He has published 'A Ride in Petticoats and Slippers' (1879); 'The Accursed Land' (1884); 'History of the Sudan Campaign' (1887); 'The Land of the Nile Springs' (1895); 'The Work of the Ninth Division' (1901). He was created K.C.M.G. in 1895.

COLVILLE, Wash., town and county-seat of Stevens County, 85 miles north of Spokane, on the Colville River and the Great Northern Railroad. It has extensive lumbering and agricultural interests and a number of small industries. Near here was established a Jesuit mission in 1846, for the christianizing of the Salishan Indians. In 1872 a reservation was established, the Indian population of which in 1910 was 785. Pop. of Colville 1,600.

COLVIN, SIR Sidney, English critic: b. Norwood, England, 18 June 1845. He was Slade professor of fine arts at Cambridge 1873–85 and keeper of prints and drawings at the British Museum 1884–1912. His writings include 'Children in Italian and English Design' (1872); 'Life of Walter Savage Landor' (1881); 'Life of Keats' (1887); 'A Florentine Picture-Chronicle' (1898); 'Early History of Engraving in England' (1905). He edited the Edinburgh edition of the works of Robert Louis Stevenson (1894–97), and also his letters. He was knighted in 1911.

COLVOCORESSES, George Partridge, American naval officer: b. Norwich, Vt., 3 April 1847. During the Civil War he served two years on the ships *Supply* and *Saratoga* and then entered the United States Naval Academy from which he was graduated in 1869. He was advanced through the several grades, becoming captain in 1905 and retiring, at his own request, as rear-admiral in 1907. He was present with Dewey at Manila Bay in 1898 and was advanced five numbers in grade "for eminent and conspicuous conduct" there. He served in nearly all the ports of the world, was instructor at the Naval Academy 1886–90 and again in 1893–96. In 1905–07 he was commandant of midshipmen and served at the War College and in command of the Key West Naval Station.

COLWELL, Stephen, American lawyer and writer: b. Brooke County, Va., 25 March 1800; d. Philadelphia, 15 Jan. 1872. He was graduated at Jefferson College, studied law, was admitted to the bar and practised for some years in Pittsburgh. About 1830 he removed to Philadelphia, became an iron merchant and amassed a fortune. He early developed a fondness for the study of finance, political economy and social science, and frequently published the results of his studies on questions of current interest or debate. During the Civil War he aided the administration with pen, purse and voice, and was a liberal supporter of the work of the sanitary commission. He was appointed by the government one of the commissioners to examine the internal revenue system and suggest improvements. He left his large and valuable library of works on political and social science to the University of Pennsylvania, where he also endowed a professorship of social science. Of his writings the following may be mentioned: ‹Relative Position in Our Industry of Foreign Commerce, Domestic Production, and Internal Trade› (1850); ‹New Themes for the Protestant Clergy› (1851); ‹The South; . . . Effects of Disunion on Slavery› (1856); ‹Ways and Means of Commercial Payment› (1858), his last and most important work.

COLY, a bird of the African family *Coliidæ*. See Mouse-bird.

COLYMBIFORMES, an order of archaic birds, all aquatic, with webbed or lobed toes, the metatarsi extraordinarily flattened, and having great power in swimming and diving. There are two suborders: (1) *Colymbi*, the loons; and (2) *Podicipedes*, the grebes (q.v.). See Ornithology.

COLZA OIL, COLESEED, or **RAPE OIL,** an oil, familiar from its use as an illuminating agent in the moderator and other lamps, expressed from the seeds of several plants of the cabbage and turnip genus, the name being originally «kolzaad» (Dutch), that is kail- or cabbage-seed. It is yellowish brown, has a specific gravity of .92, and little or no smell, and dissolves in hot alcohol and in ether. It becomes thick and solid only at very low temperatures; when heated it volatilizes, but not completely, undergoing partial decomposition. It is purified for use by continued agitation with sulphuric acid, which destroys mucilaginous matter from the seed, and washing with water to remove all trace of the acid. The oil is used in Great Britain and on the Continent in soap-making, tanning, fulling of cloth, lubricating machinery and for burning. For the last it is so well adapted that it was specially recommended for lighthouse purposes. It is brilliant and steady, is managed with very little attention and is cheap. In these respects it is said to be superior to spermaceti.

COMA, *in medicine,* a state of complete or almost complete unconsciousness, resulting from various diseases, as apoplexy; from poisons, as opium, uræmia, diabetes, alcohol; from accident or injury to the brain; or from excessive cold. In cases of coma the pulse is usually slow and soft, but sometimes quick, the breathing is rarely stertorous, the pupils of the eyes are commonly more or less dilated and the face is often swollen and livid. The patient is either altogether unconscious and incapable of replying to any question, or he makes incoherent and rambling statements. Stimulating agencies and blistering are sometimes used in the treatment of comatose cases, but generally the disease or injury producing the condition determines the remedy.

COMA BERENICES, bĕr-ĕ-nī'sēz («the Hair of Berenice»), a northern constellation, the name of which is due to the flattery of Alexandrine astronomers, who professed to see in the new constellation a lock of the beautiful hair of Berenice, wife of Ptolemy Euergetes. Callimachus in Greek and Catullus in Latin wrote poems descriptive of the apotheosis of the curl. Ptolemy did not introduce it into the Almagest as a distinct constellation, but called it *Plokamos* (Gr., «hair,» or «curl»). Tycho Brahe restored it as a distinct constellation in his catalogue of 1602. It is formed of rather faint stars, none being brighter than the fourth magnitude. Baily, in the «B. A. C.» in 1845, attached the first three letters of the Greek alphabet to three of the brighter stars. The constellation is surrounded by Ursa Major, Canes Venatici, Boötes, Virgo and Leo.

COMACCHIO, kō-mä-chē'o (ancient Comactium), Italy, town in the province of Ferrara, in Emilia, about 20 miles north of Ravenna and 30 miles southeast of the city of Ferrara. The town is built on 13 islands which are connected by bridges. The chief industries are fishing and manufacturing salt.

COMAN, Katherine, American teacher: b. Newark, Ohio, 23 Nov. 1857; d. Wellesley, Mass., 11 Jan. 1915. She was graduated with the degree of Ph.B. at the University of Michigan 1880, and at once joined the faculty of Wellesley College, remaining there until her death. She was professor of economics there from 1900 to 1914. She went abroad in 1913–14, and made a special study of social insurance, as worked out in England, Spain, Belgium and the Scandinavian countries. This study, which was to have included France, Germany and other countries of Europe, was interrupted by the illness which brought her home to die. She published ‹Growth of the English Nation› (1895); ‹History of England› (1899); ‹History of England for Beginners› (1901), and in collaboration with her colleague Katherine Lee Bates, ‹English History Told by English Poets› (1902); ‹Industrial History of the United States› (1905); and ‹Economic Beginnings of the Far West› (2 vols., 1911).

COMANA, kŏ-mä'nạ. (1) An ancient city of Cappadocia, supposed to be the modern Elbostan, on the river Sarus, celebrated in antiquity for its temple of Artemis Tauropolis, and for the great devotion of its inhabitants to the worship of that goddess. Over 6,000 persons were engaged in the service of the temple. The city was governed by the high priest, who was always a member of the reigning family, and took rank next to the king. (2) A city of Pontus, now Tokat, on the river Iris, and almost as famous for its devotion to Artemis as the other city of the same name. There is evidence to show that this worship to Artemis or Ma, as the goddess was generally called in both the cities of Comana, was originally that given to the Moon goddess; and it had some suggestive resemblances to that of Isis in Egypt.

COMANCHE, kō-măn'chē, **CAMANCHE, CHOUMAN, COMANDE.** Their own name is Nüm, «people»; the Sioux gave them one which the French turned into Padouca, a powerful and ferocious tribe of the widely distributed Shoshonean stock, speaking the same language as the Shoshones of Wyoming, and traditionally their neighbors. When first made known to the whites by the French under Dutisné, they were located in eastern Colorado. They had already obtained horses from the Spaniards and become nomads and expert horsemen, and horse-breeders, for the French bought horses from them. In 1724 another French expedition made a treaty with them. They seem shortly after to have been pushed southward by the Sioux, and we find them later roving the plains of northwestern Texas, making plundering raids from Colorado through Texas, deep into Mexico, and westward to Santa Fé. They lived in skin wigwams, with few or no fixed villages except near the Spaniards, and were in eight bands, with a very loose organization. They probably numbered 5,000 warriors, and 25,000 in all, at their best estate. One village near the Spaniards had 800 warriors, and over 4,000 in all. They were at constant war, both with the Spaniards and the other Indian tribes, and in 1783 engaged in a wholesale war with the former; but Anza inflicted a crushing defeat on them, killing 30 of their chiefs, and there was peace for a time. In 1816 they are said to have lost 4,000 of their number by an epidemic of smallpox; but they were still estimated at 9,000; and in 1847 at 10,000 or 12,000, one-fifth warriors. They recruited their numbers by kidnapping and adopting Mexican children, boys or girls. For all the years of immigration into those regions, down to 1875, they were the bloody and relentless scourge of the white settlers, and furnished a good part of the Indian horrors of the Southwest. They were once placed on a reservation in Texas, but were driven off. In 1868 the bulk of them agreed to go on a reservation in western Oklahoma; but the Quahada or Staked Plain band refused, and kept up their murderous forays. They were sharply punished by Colonel McKenzie at McClellan's Creek in 1872, in which year they were estimated at 3,218 on the reservation, with 1,000 more in roving bands. The last of these surrendered in 1875. In 1901 their reservation in Oklahoma was thrown open to settlement. At present they number about 2,000. Consult Hodge, W. H., ‘Handbook of American Indians’ (Washington 1907).

COMANCHE, Tex., city and county-seat of Comanche County, 110 miles southwest of Fort Worth, on the Fort Worth and Rio Grande and the Saint Louis and Southwestern railroads. It is an agricultural centre, has brickyards, cotton gins and stockyards. Comanche was settled in 1857 and is governed under a charter of 1876 which provides for a mayor, elected for two years, and a council. The waterworks are municipally owned. Pop. 2,756.

COMANCHEAN. See CRETACEOUS.

COMAYAGUA, kō-mā-yä'gwä, or **VALLADOLID LA NUEVA,** Honduras, C. A., a town, capital of the department of the same name, situated on the southern border of the plain of Comayagua, on the Humuya River, 220 miles east of Guatemala. It is the seat of a bishopric, has a large and handsome cathedral, a richly endowed hospital, several convents and a college. It was founded by Alonzo Caceres in 1540, and up to 1827 was a thriving place, with about 18,000 inhabitants. In that year, however, it was burned by the monarchical faction of Guatemala, and has never recovered. Pop. 3,100.

COMB (A.S. *camb*), an instrument to separate and adjust the hair, too well known to need description. We have no certain authority that either the Greek or the Etruscan women applied this useful article regularly to their hair in the operations of the toilet, although it was used by the Greek women, at least, to arrange their hair. The combs used by the Greeks were of boxwood, and had teeth on both sides, while those used by the Egyptians had teeth only on one side. The Romans also had combs of boxwood, and at a later time probably of ivory and other materials. In the work of Guasco Della Ornatrici there are several representatives of ancient Roman combs. One of them is a long one of box, of which the handle is overlaid with ivory, and appears to have been ornamented with a small meander in gold. It has two rows of fine teeth, delicately wrought and well proportioned. Modern combs are generally made of tortoise shell, ivory, horn, wood, bone, metal, india rubber and celluloid. Machinery has been perfected for their production. In making combs the material is first cut to the form which the comb is to have, and the teeth are then made all at once by means of circular saws mounted on the same axle and placed at a suitable distance from one another. Large combs in horn or shell, with wide teeth, are sometimes made with a punch, which cuts in the piece the teeth of two combs by the same operation. The teeth are afterward finished with the file. Combs made of vulcanized india-rubber, which are now so common, are made by pressing the caoutchouc while soft into molds, and then bringing them to the desired degree of hardness by the process of vulcanization. Canova and other modern sculptors have made great use of the comb, placed in the heads of their women, to which they add much grace and elegance.

COMB, the wax cavities in which bees lodge their honey. The comb of a bee is composed of hexagonal cells, of which there are two tiers, the cells of which are placed end to end, so that the three plates of wax, which serve as the bottom of the cell in the one tier, constitute also that of the corresponding one in the other. The mathematical problem in «maxima and minima,» how to construct the greatest number of cells within the smallest possible room, and with the least expenditure of material, is solved.

COMBA, kŏm'bä, **Emilio,** Italian author: b. San Germano Chisone 1839. He became a professor at the Istituto Valdese at Florence; there he founded in 1873 the review entitled *Rivista Cristiana,* devoted to the discussion of religious problems and topics. He is the historian of the religious reform in Italy. His works include ‘Introduzione alla storia della riforma in Italia’ (1881); ‘I nostri protestanti’ (1897); ‘Storia dei Valdesi’ (latest ed., 1901; Eng. trans., London 1889).

COMBACONUM, Madras, British India, town in the district of Tanjore, 194 miles from Madras. It is regarded by the Hindus as a place of peculiar sanctity, and is inhabited largely by the Brahmans. It contains numerous pagodas and tanks with water, supposed to come from the Ganges River. One of the oldest places in southern India, it is one of the strongholds of Brahmanism and Brahmanical culture. Pop. about 64,000.

COMBASOU, the trade name of an African weaver-bird (*Hypochæra chalybeata*), kept in aviaries for its pretty plumage and manner. The male is black with a bluish gloss, bill white and legs pink; the female is brownish.

COMBAT, in its general sense signifies a fight. The noun form is derived from the verb and the latter from the French of the same form. Owing to the prevalence of single combats in Normandy and England in early Norman times, the word combat, in England, where it was not altogether at home, came to be restricted in sense generally to a fight between two individuals or between two parties, each chosen to uphold the honor of its own party or faction. Trial by combat and the ordinary single combat encounter have both the same origin, which goes back to the dim ages long before formal history began. Originally single combat was frequently made use of to adjudge the guilt or innocence of the contending parties, and it was itself the same in import and origin as the trial by combat in all its various forms. The witch was tried by water, which she was popularly supposed to hate. In India women accused of unfaithfulness to marriage vows were subject to trial by fire to test their innocence or guilt. The single combat, early in the organization of society, came to be a union of two social inclinations, that of the tendency of two disputants to fight out their quarrel, and that of the potent influence of magic in which all primitive tribes believed and which was supposed to help the more powerful contendant. Later on this magic idea of the barbarian races and the savages gradually surrounded itself with a moral atmosphere, the result of attributing the magic itself to the influence of the gods and their interference in behalf of one of the contendants, generally the one in the right. Later the idea of a divine guardianship of every human being came to lend a still more pronounced moral atmosphere to the single combat fought to decide a question of right or wrong. Gradually, however, this moral idea lost ground in ordinary single combat encounters, as the age of chivalry advanced, without a weakening of influence in its own particular sphere of trial by ordeal, into the service of which the trial by single combat still continued frequently to be pressed to the end of the age of chivalry. Very ancient usage was evidenced by Goliath (1 Sam. xvii), and by Ajax in the ‘Iliad,’ and by many of the characters in the mythologies of various nations. Among the Scottish clans the combat was sometimes between individuals; but just as often between a certain picked number on each side. Then again not infrequently one clan defied another to combat. The Norse practice of principals going alone to a small holm or island, to be free from disturbance while settling their quarrels by strength and skill, gave rise to the Saxon term *Holm-Gang*. In the days of chivalry the single combat received the strong support of law and custom, and was resorted to both in civil and in criminal cases. The accuser or plaintiff swore to the truth of his tale, the other gave him the lie, a gage of battle was thrown down and taken up, and they fought it out under rules before an assembly, the supposition being that God would give victory to the right. The barbarous practice survives in European countries, without its excuse of superstition, in the modern duel, which is legally prohibited in the United States. In England it was still a legal method of trial well into the 19th century, but was abolished by statute 59 George III, cap. 48.

COMBAT TRAINS. See AMMUNITION.

COMBE, kōm or koom, **Andrew**, Scottish physiologist: b. Edinburgh, 27 Oct. 1797; d. there, 9 Aug. 1847. He was educated for the medical profession, and in 1822 he commenced practice at Edinburgh, and had considerable success. In 1838 he was appointed one of the physicians extraordinary to the queen in Scotland. His chief works are ‘Observations on Mental Derangement’ (1831); ‘Principles of Physiology’ (1834); ‘Physiology of Digestion’ (1836); ‘A Treatise on the Physiological and Moral Management of Infancy’ (1840). Like his brother George (q.v.), he was a zealous phrenologist.

COMBE, George, Scottish phrenologist: b. Edinburgh, 21 Oct. 1788; d. Moore Park, Surrey, 14 Aug. 1858. He was a brother of Andrew Combe (q.v.), was bred to the law, and in 1812 admitted a member of the Society of Writers to the Signet. He was the first to introduce the doctrines of phrenology into Great Britain; and visited Germany and America, lecturing on his favorite science. He was also a zealous promoter of the cause of popular education and social progress; and was among the first to advocate compulsory education and the establishment of a board of health. He was a frequent and important contributor to the *Phrenological Journal* and he wrote for other publications, and in his own works, on education, theology, politics, economics and other subjects and matters of general interest. He had a way of presenting his subject that made him an immensely popular writer. Besides the ‘Constitution of Man’ (1828), which has had an enormous circulation, he was the author of ‘A System of Phrenology’ (1825); ‘Lectures on Popular Education’ (1833); ‘Moral Philosophy’ (1840); ‘The Life and Correspondence of Dr. Andrew Combe’ (1850); ‘Principles of Criminal Legislation and Prison Discipline Investigated’ (1854); ‘Relation Between Science and Religion’ (1857).

COMBE, William, English writer: b. Bristol 1741; d. Lambeth, 19 June 1823. His ‘Tour of Dr. Syntax in Search of the Picturesque’ (1812) was once very popular. Other works by him are ‘The Diaboliad,’ a poem (1776); ‘The Devil Upon Two Sticks in England’ (1790). After 43 years within the rules of a debtor's prison, and previous vicissitudes of fortune from army officer to cook, he died in Lambeth.

COMBERMERE, kŭm'bẽr-mẽr, **Sir Stapleton Cotton**, VISCOUNT, English general: b. Denbighshire, 17 Nov. 1773; d. Clifton, 21 Feb. 1865. He entered the army in 1790, served in Flanders and India, and with the rank of major-general accompanied the Duke of Wellington to the Peninsula in 1808. In 1809 he succeeded to the family baronetcy. At Salamanca, in 1812, he headed the brilliant cavalry charge which greatly contributed to the decisiveness of that victory, and was subsequently present at the battles of the Pyrenees, Orthez and Toulouse. Shortly after the last battle he was raised to the peerage with the title of Baron Combermere. From 1817 to 1820 he was governor of Barbados; 1822–25 commander-in-chief of the army in Ireland, and in 1825 was sent to India as commander-in-chief of the forces there, to put down the usurper Doorjun Sal. After a siege of less than two months, Bhurtpore, the chief city of Doorjun, was taken by storm on 6 Feb. 1826, for which Combermere was raised to the rank of viscount. The remainder of his life was passed in England. In 1852 he was appointed constable of the Tower; and in 1855 made a field-marshal.

COMBES, koomz, **Justin Louis Emile,** French statesman: b. Roquecourbe, Tarn, France, 6 Sept. 1835. He was educated in a Roman Catholic seminary for the priesthood, but subsequently studied medicine, and began practice in Pons, where he filled various posts of responsibility, such as those of mayor and county councillor. In 1885 he was elected to the Senate, of which he was vice-president 1893–94, becoming Minister of Public Instruction in 1895. He has been active in the reorganization of primary and secondary education. In June 1902 he succeeded Waldeck-Rousseau as President du Conseil des Ministres. In this capacity he has enforced the Association Act, abolishing liberty of teaching in France and aimed at the clergy. The law against the religious orders was enforced with great severity, and over 500 teaching, preaching and commercial orders were suppressed under the Combes régime. His opponents have claimed that this has been done with needless severity. It has caused widespread disturbances throughout the country. On his becoming Prime Minister, M. Combes announced his intention to reduce the period of military service to two years, and to establish a general income tax. Steps were also taken during his ministry which were to lead later to the separation of Church and State. In spite of the fact that M. Combes was upheld by the Chamber in all his acts, he resigned in 1905 because of the intense bitterness which these acts aroused among the Conservatives. M. Combes is a latter-day Voltaire, with all of his master's hatred of clericalism in all its forms. To him the Catholic Church appears as the sworn enemy of modern life and culture and particularly of the Republic of France. Personally he is what is called in France an «austere Republican,» a man simple in his private life and rigid in his adherence to the principles of the French Revolution.

COMBINATION, *in mathematics,* the selection, from a given set of objects, of a stated number without regard to their arrangement. Each combination can, by varying the arrangement of the constituent objects, be made to give rise to several permutations. Thus of the four letters, *a, b, c, d,* four combinations, three at a time, are possible; namely, *a b c, a b d, a c d, b c d.* Each of these combinations, however, produces six permutations, according to the order of the letters. For example, the combination *a b c* yields the six permutations *a b c, a c b, b c a, b a c, c a b, c b a.* Thus, of the four letters, *a, b, c, d,* the number of permutations three at a time is 24. It is easy to prove that the number of permutations of n objects two at a time is $n\ (n-1)$; three at a time $n\ (n-1)\ (n-2)$; four at a time $n\ (n-1)\ (n-2)\ (n-3)$; and so on, the number when r at a time are taken being $n\ (n-1)\ (n-2) \ldots (n-r+1)$. The number of permutations of n things n at a time is therefore $n\ (n-1)\ (n-2) \ldots 4, 3, 2, 1$, a product usually represented by $\lfloor n$ or $n!$, and read as «factorial n.» The theory of permutations and combinations is of very great importance in higher mathematics, and may be studied in any textbook of algebra, such as those by Chrystal, Todhunter and Smith.

COMBINATION, Industrial, *in law,* a union of individuals, companies or corporations formed for the purpose of accomplishing a particular object or purpose. In the United States a combination is not unlawful in itself, though it becomes so if it seeks to obtain its ends in an unlawful manner or by unlawful acts. Combinations may be divided into two general classes, those formed by employees or «labor,» and those formed by employers or «capital.» Combinations formed by employees, or labor, generally bear the designation of unions. The purpose of a union is to better the condition of its members in relation to the work in which they are engaged, by securing higher wages, less working hours, different methods of doing the work and similar changes. A union generally tries to enforce its demands by striking, or threatening to strike. A strike is a combination effected by employees whereby at a prearranged time they all stop working unless their demands are granted. A strike is usually organized through a union.

A boycott is a combination to cause a loss to a particular person by restraining others from doing business with that person. It is often so conducted that the person is affected socially as well as in his business. When a boycott has been declared against a person, any one having either business or social relations with that person is also boycotted.

When the objects of such combinations are effected in a peaceful and lawful manner there is no legal means by which they can be interfered with; but it generally happens that when a number of working-people strike there is a breach of contract, or a conspiracy, in which case there is a legal redress. The usual action is for the injured party to proceed in equity and ask for an injunction restraining the former employees from committing certain acts. Sometimes damages are asked for, and it makes no difference what the status is when the cause is heard, as damages can be recovered for acts committed during a strike, although the strike may have ended long before the demand for damages.

Combinations formed by employers, or capital, are usually known as trusts. Trusts are generally formed with the object of regulating the supply or price of a product, or both, or for the purpose of reducing expenses or competition.

It has been found very difficult to frame a law which will be effective against all the different arrangements under which a trust can do business. The State courts have no jurisdiction outside the limits of the State to which they belong, and it is very seldom that a trust would be formed whose business would be confined to any one State. The Federal government has passed several anti-trust laws, and up to the present time the most effective way of dealing with this class of combinations is by laws passed under the clause in the Federal Constitution (Art. I, § 8, cl. 3), which provides that Congress shall have power «to regulate commerce with foreign nations, and among the several States, and with the Indian tribes.» See Boycott; Strikes and Lockouts; Trust Companies. Consult Jenks, T., 'Trusts and Industrial Combinations' (in Bulletin of Department of Labor, No. 29, July 1900).

COMBINATIONS AND PERMUTATIONS. Combinations and permutations deal with the arrangement and grouping of objects. They arose out of problems such as these: «How many numbers can be thrown with two dice?» «How many striped flags can be made with three colors?» «How many whist hands of 13 cards each can be dealt from a pack of 52 cards, the cards being put back and shuffled after each deal?» Although games of chance furnished most of the problems in the beginning, the modern aspect of the subject finds applications in statistics, probabilities and the theories of numbers, finite group, and algebraic forms. Aside from isolated references to single questions in the works of the Greek mathematicians, the earliest attempt at organized treatment of combinations and permutations occurs in the treatise of the Hindu astronomer Bhaskara Acharya in the 12th century. The subject received no further attention until the time of Cardan (1501–76) and another century elapsed before Pascal (1623–62) succeeded in building it into a science, as yet, however, in its infancy. Hindenburg (1741–1808) is regarded as the founder of the modern theory, but his school, known as the «combinatory school» held aloof from the rest of mathematics. Since then the researches of Jacobi, De Morgan, Sylvester, Cayley, Franklin, Mathews and MacMahon have shown its use in the general theories of arithmetic and algebra. We shall take up only elementary combinations and permutations; for a complete treatment of combinatory analysis consult MacMahon, 'Combinatory Analysis' (1915), and Netto, 'Kombinatorik' (1901).

Permutations.— A permutation of n elements taken r at a time is a linear arrangement, as in a row, of r of those n things with regard to the order in which they may be placed; e.g., $a\ b\ c$ and $a\ c\ b$ are permutations of a, b, and c. This name was given by Jacob Bernoulli ('Ars conjectandi' 1713). The number of permutations will be denoted by $P_{n,r}$, n being the total number of elements and r the number in a group; the notation $(n\,r)$ or $(n)_r$ is often used. To find $P_{n,r}$, observe that the first one of the r objects may be selected in n ways and for each selection there are $n-1$ things left from which to choose the second object; both may thus be chosen in $n(n-1)$ ways. By continuing the argument we find:

$$P_{n,r}=n(n-1)(n-2)\ldots(n-[r-1])$$

there being r factors. The following table gives numerical values of $P_{n,r}$ from $n=4$ to 10 and $r=2$ to 10. From the table $P_{8,5}=6720$ and is found under $n=8$ and opposite $r=5$. $P_{3,3}=P_{3,2}=6$; $P_{2,2}=P_{2,1}=2$. S_p will be explained later.

VALUES OF $P_{n,r}$ AND S_p

n r	10	9	8	7	6	5	4
2......	90	72	56	42	30	20	12
3......	720	504	336	210	120	60	24
4......	5,040	3,024	1,680	840	360	120	24
5......	30,240	15,120	6,720	2,520	720	120	...
6......	151,200	60,480	20,160	5,040	720	......	...
7......	604,800	181,440	40,320	5,040	......	......	...
8......	1,814,400	362,880	40,320	......	......	......	...
9......	3,628,800	362,880	......	......	......	......	...
10......	3,628,800	......	......	......	......	......	...
S_p....	9,864,100	986,409	109,600	13,699	1,956	325	64

When $r=n$

$$P_{n,n}=n(n-1)(n-2)\ldots\pm 2 \ n \textit{ factors.}$$

This product of the integers from 1 to n is represented by

$$n!\ n(n-1)\ldots 2$$

and is read *factorial* n; it is due to Kramp ('Eléments d'arithmétique universelle,' 1808). The number of r permutations is therefore written

$$P_{n,r}=\frac{n!}{(n-r)!}$$

Now when $r=n$, $P_{n,n}=n!$ hence $(n-n)!$ or $0!$ must equal unity. That is, if Kramp's notation is to be carried out consistently we must regard $0!$ as a symbol for unity although according to the strict meaning of $n!$ factorial 1 is 1 and factorial 0 is 0. But as both $1!$ and $0!$ must be taken as unity

$$P_{n,n}=P_{n,n-1};$$

the table shows this to be so.

When n is large as in the theory of probabilities, $n!$ can be computed from the series due to Laplace ('Théorie des probabilités'):

$$n!=n^n e^{-n}\sqrt{2\pi n}\left(1+\frac{1}{12n}+\frac{1}{288n^2}+\ldots\right)$$

which as n increases indefinitely approaches

$$n!=n^n e^{-n}\sqrt{2\pi n}\,,\ \textit{approx.};$$

this is Stirling's formula ('Methodus Differentialis,' 1730). For example, when $n=10$ this approximation gives 3,598,700 which differs from the correct value in the table by 0.83 per cent. For $n=20$ the error is less than one-half per cent. The number of permutations often runs astonishingly high; the number of whist hands in the problem stated at the beginning of this article is $P_{52,13}=635{,}013{,}559{,}600$ so that the probability of a player getting the same hand twice in a lifetime is remote to say the least.

The sum of the permutations of n things successively one at a time, two at a time, and so on up to all at a time is

$$\sum_{m=1}^{m=n} P_{n,m}=S_p,\ \textit{say},$$

where S_p is given in the last row of the table.

Since

$$P_{n,m}=\frac{n!}{(n-m)!}\ \textit{and}\ P_{n,n}=P_{n,n-1}$$

$$S_p=n!\left(1+\frac{1}{1!}+\frac{1}{2!}+\ldots+\frac{1}{(n-1)!}\right)$$

When n is large the parenthesis approaches the base of Naperian logarithms $e=2.7183\ldots$

$$S_p = \frac{n!}{e} = n^n \, e^{-n-1} \sqrt{2\pi n} \text{ approx.}$$

The following results are useful: consult Chrystal, 'Text Book of Algebra'; Hall and Knight, 'Advanced Algebra.'

1. The number of permutations of n things of which a are alike, b are alike and the rest different is $n!/a!b!c!$

2. The number of permutations of n things in a circle is $(n-1)!/2$ if the clockwise or anti-clockwise order is indifferent. Thus 8 people may be seated around a table in 2520 ways.

3. The number of r permutations of n things when each thing may be repeated up to r times is n^r. With a night signal of 4 colored lights each of which may occupy 3 positions, $3^4=81$ signals may be made.

Combinations.— In a combination the order of elements in a group is indifferent, i.e., $a\ b\ c$ and $a\ c\ b$ are not different combinations. The word is due to Pascal ('Usage du triangle arithmétique,' 1665). The formula for combinations follows from that of permutations, for $P_{n,r}$ consists of groups of r things at a time and each group of r exists in $r!$ arrangements; hence if the arrangements within a group are not counted

$$C_{n,r} = \frac{P_{n,r}}{r!} = \frac{n!}{r!(n-r)!} = \frac{n(n-1)\ldots(n-r+1)}{r!}$$

But each time that a group of r is formed a group of $n-r$ is left

$$\therefore C_{n,r} = C_{n,n-r}$$

which shortens the computation when $r > n/2$

VALUES OF $C_{n,r}$ AND S_c

r \ n	10	9	8	7	6	5	4
2	45	36	28	21	15	10	6
3	120	84	56	35	20	10	4
4	210	126	70	35	15	5	1
5	252	126	56	21	6	1	....
6	210	84	28	7	1	....	....
7	120	36	8	1	....	....	....
8	45	9	1	......	....	....	....
9	10	1	......	......	....	....	....
10	1	......	......	......	....	....	....
S_c	1,023	511	255	127	63	31	15

The coefficients of the binomial expansion are combinations:

$$(a+b)^n = a^n + C_{n,1}\, a^{n-1} b + \ldots + C_{n,n}\, b^n$$

when $a = 1 = b$

$$2^n - 1 = C_{n,1} + C_{n,2} + \ldots + C_{n,n} = S_c, \text{ say,}$$

which is sometimes called the *total* number of combinations and is the total number of ways in which a selection can be made by taking some or all of n things. Now each element may be taken or left and for each of these two ways of dealing with it each remaining element may be taken or left; therefore the number of ways of selecting or leaving the n elements is 2^n. But this includes the one case in which all are left; thus $S_c = 2^n - 1$ as above. As an interesting illustration consider the Baudot Signal Code which is used by the Western Union Telegraph Company for the simultaneous transmission of messages. Each character (letter of the alphabet, etc.) consists of some or all of five crosses occupying five blank spaces represented by dashes; e.g., $a = + + - - -$, $b = + - - + +$, $c = - + + + -$. Five dashes mean that no crosses are used, i.e., the case where all the elements are left. The number of signals possible is consequently $2^5 - 1 = 31$.

RICHARD F. DEIMEL,
Department of Mechanics, Stevens Institute of Technology.

COMBUSTION is chemically the rapid oxidation of a substance with the evolution of light and heat. It is generally accompanied by flame and the production of carbon dioxide, carbon monoxide and the vapor of water. The substances which are consumed are popularly termed combustibles. Chemically, the substances oxidized are the carbon and hydrogen components of the combustibles. The heat in combustion is a result of the chemical changes which take place during oxidation. The light is emitted by incandescent particles of carbon in the flame. The temperature to which any particular substance must be raised in order that it shall take fire is called the "ignition point" of that substance. Ignition points vary with the different combustibles. They may even be below the temperatures which ordinarily prevail. In such case the substance will burst into flame when that temperature is reached, and this phenomenon is called "spontaneous combustion." Some kinds of vegetable and animal oils when spread out thinly, as on a rag, may oxidize so rapidly as to become very hot, and if in a confined place will eventually take fire spontaneously.

In combustion two classes of combustibles are recognized: (1) Those which in the process generate heat sufficient to continue the combustion until the whole of the combustible is consumed; (2) those in which the combustion can only be kept continuous by the constant application of external heat. When the processes of combustion take place instantaneously the combustion is called an explosion. Acetylene may be mentioned as an example in this connection. It has a tendency, especially when under pressure, to decompose, with the evolution of so great a degree of heat as to expand enormously and result in an explosion. The economic use made of combustion is chiefly for the generation of power, but also in cooking and the heating of houses and the production of all artificial lights but electric light. The combustibles utilized in this way are called fuels. See EXPLOSION; FUELS; FURNACE; GAS; HEAT; LIGHT; OXYGEN; PHLOGISTON. Consult Hayes, J. W., 'Combustion and Smokeless Furnaces' (Chicago 1915).

COMBUSTION, Spontaneous, the ignition of bodies by the internal development of heat without the application of an external flame. It not infrequently takes place among heaps of rags, soot, paper, woolens, cotton and other substances strongly lubricated with oil, when, if the oil is freshly made, it is very ready to combine with the oxygen of the atmosphere and give out carbon and hydrogen. The heat thus developed, diffusing itself through a mass of highly inflammable substances, will in certain circumstances be sufficient to set them on fire. A remarkable instance of spontaneous combustion among hemp was afforded in June 1861, being the cause of the terrible conflagration in Tooley street, London. Bituminous coal, piled up in heaps, is apt to ignite by the decomposition of the sulphuret of iron which it contains. In ships laden with coal impregnated with sulphur and iron in the form of bi-sulphuret of iron (pyrites), decomposition of this substance is sometimes occasioned by the access of moisture, and heat is evolved to such a degree as to cause the combustion of the coal, especially if air is admitted freely. Water poured upon the burning material only adds to the intensity of the action. Charcoal and green hay are liable to spontaneous combustion. A somewhat unusual case of spontaneous combustion occurred in 1916, when an explosion in a flour mill was found to be due to accidental spark ignition of an intimate mixture of flour dust and air. Legends and tales exist of spontaneous combustion of human bodies; but no authenticated case has been recorded, and it is regarded as impossible.

COMBUSTION, Velocity of. It can be shown by direct experiment that the burning of a grain of powder in a fire-arm is progressive, and that the size of the grain exerts a great influence on the velocity of the projectile. For instance if one piece of the press cake were placed in a small mortar and fired, little or no motion would be given to the projectile. If this piece be divided into seven or eight parts, the projectile will be thrown a short distance; and by increasing the number of parts or grains, so will the effect of the powder on the projectile also increase. The progressive burning of powder is further confirmed by the fact that burning grains are sometimes projected from the gun with sufficient force to perforate screens of paper and wood at considerable distance. It is even found that they are set on fire in the gun and afterward extinguished in the air before they are completely consumed. The velocity of combustion of powder varies with the purity, proportions, triturative, density and condition of the ingredients, also with the pressure under which the powder is burned. By varying the proportions and increasing the sulphur there is a tendency to make a more violent explosion and a more quickly kindling mixture. A general formula may be deduced to show the amount of gas developed and the quantity of powder burned at any instant of the combustion of a grain or charge of powder. For this purpose take a spherical grain of powder and consider it inflamed over its entire surface. Let t represent the time of burning, from the instant of ignition to the moment under consideration; R, the radius of the grain. Since the combustion of the grain passes over the radius R in the time t, the velocity of combustion is equal $\frac{R}{t}$ and for the time, t, it will pass over the space $t\frac{R}{t}$ or $R\frac{t}{t'}$, the radius of the decreasing sphere will therefore be $R\ (1-\frac{t}{t'})$. The volume of the grain of powder and that of the decreasing sphere are $\frac{4}{3}R^3$ and $\frac{4}{3}\pi R^3(1-\frac{t}{t'})^3$ respectively; and their difference π or the quantity of powder burned, will be equal to $\frac{4}{3}\pi R^3(1-\frac{t'}{t})^3)$. The first factor of this expression represents the primitive volume of a grain of powder, and the other expresses the relation of the volume burned to the primitive volume. The same expression will answer for all of the grains of a charge of powder, if they are of the same size and composition; consequently, if we let A represent the volume or weight of the grains composing a charge of powder, the quantity remaining unburned after the time, t, will be represented by $A(1-\frac{t}{t'})^3$; and the quantity burned by $A1-(1-\frac{t}{t'})^3)$. Although the grains of powder are not spherical, their sharp angles are partially worn away by rubbing against each other in glazing and in transportation; and the mode of fortification and inspection reduces the variation in size within narrow limits; therefore, if we examine the influence which the actual form and size of the grains exercise over the phenomenon of combustion of powder, we shall find that the effect varies but slightly from that due to the spherical form. If we consider the velocity of the projectile on leaving a gun and the time necessary to overcome its inertia in the first period of its movement, we shall see that a very large portion of each grain is burned up before the projectile leaves the gun. If the size of the grain be increased, the effect will be to diminish the amount of gas evolved in the first instant of time, and to diminish the pressure on the breech. This principle has been made use of to increase the endurance of large cannon.

COMBUSTION ENGINE. See INTERNAL COMBUSTION ENGINE.

COMÉDIE FRANÇAISE, kō'mā-dē' frän'-säs', the official name of the national theatre of France which is supported by public funds for the purpose of advancing dramatic art. It was long known popularly as «La Maison de Molière,» or Molière's Theatre, even after it had become, by royal decree in 1680, a national institution; and the two great bodies of actors then in Paris, those acting at the Hotel de Bourgogne Theatre and those at the Générgaud Theatre, had been united and fused into one body. The former, which was Molière's dramatic institution, had originally been an old theatre where miracle plays had been presented as early as 1543. Thus the Comédie Française may be said to have an unbroken tradition reaching back to the days of Molière, and to have had theatre connections for more than a century previous to the death of the great dramatist in 1673. Two years after the amalgamation of the dramatic companies they received a royal grant of 12,000 livres ($2,400) per year; and seven years later they took, for the first, their present designation of players of the «Comédie Française.» From 1770 to 1782 the «Comédie» had quarters in the royal palace of the Tuileries. But the Revolution of 1789 divided the players of the «Comédie Française» into two strongly antagonistic political parties and disrupted the organization to such an extent that all public performances were suspended. Each party reorganized, some months later, as an independent theatrical organization, the Royalists taking the name «Théâtre de la Nation» and the Republicans that of «Théâtre de la République.» In 1793 the former theatre closed its doors and its players were arrested by the Committee of Public Safety; but they were subsequently released and allowed to again open their theatre. Napoleon, in 1812, issued regulations for the government of the national theatre, which are still, with some subsequent modifications, in force. The government appoints a general manager of the theatre, the members of the stock company of which divide the profits according to laws and regulations prescribed by the articles of incorporation of the organization. The «Comédie Française» receives from the French government an annual pension of 240,000 francs. Its membership is divided into «sociétaires» and «pensionnaires.» The former are regular members of the organization and as such receive a pension of 4,000 francs a year after 20 years of service, while the latter are paid actors who may, after a certain length of service, become «sociétaires.»

The building of the «Comédie Française» was so badly damaged by fire in 1900 that it had to be practically rebuilt. This resulted in making the edifice much more modern in every way. The names of nearly all the great actors and dramatists of France have, at some time in their career, been associated with that of the «Comédie.»

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COMÉDIE HUMAINE, ũ-mān, **La**, a series of novels by Balzac, so designated by their author, and intended to form a picture of the manners and morals of the period. The first volume of the ‘Comédie Humaine’ appeared in 1829; but it was not until 1842 that Balzac adopted the general title. The author intended to present a panorama of his time in France, and he wrote nearly 100 novels without completing the herculean task he had set himself.

COMEDIETTA, kō-mā-dĭ-ĕt'tạ (It. diminutive of *commedia*), a dramatic composition of the comedy class, but not so much elaborated as a regular comedy, and generally consisting of one or at most two acts.

COMEDONES, kŏm'ẹ-dōnz, a name applied to the little cylinders of sebaceous and epithelial substances which are apt to accumulate in the follicles of the skin and to appear on the surface as small round black spots. When squeezed out they have the appearance of minute maggots or grubs with black heads, and thence have derived their name. They are generally associated with a weak state of the skin as well as of the individual. Generous diet and tonic treatment with soap-and-water cleansing and friction will be useful; as an astringent to invigorate a debilitated skin, a lotion of corrosive sublimate (two grains) in emulsion of bitter almonds (one ounce) and dilute alcohol will be effective. See Acne.

COMEDY, a dramatic representation of a light and amusing nature, in which are satirized pleasantly the weaknesses or manners of society and the ludicrous incidents of life. Comedy took its origin in the Dionysian festivals, with those who led the phallic songs of the band of revelers (Gr. *kōmos*) who, at the vintage festivals, gave expression to the exuberant joy and merriment by parading about, dressed up, and singing jovial songs in honor of Dionysus. These songs were frequently interspersed with extemporized jokes at the expense of the bystanders. Comedy first assumed a regular shape among the Dorians. The first attempts at it among the Athenians were made by Susarion, a native of Megara, about 578 B.C. Epicharmus first gave comedy a new form and introduced a regular plot. That branch of the Attic drama known as the Old Comedy begins properly with Cratinus. It lasted from 458 B.C. to 404 B.C. The later pieces of Aristophanes belong to the Middle Comedy. The chorus in a comedy consisted of 24. The Middle Comedy lasted from 404 B.C. to 340 B.C. and the New Comedy till 260 B.C. Middle Comedy found its materials in satirizing classes of people instead of individuals. New Comedy answers to the comedy of the present day. The most distinguished of Roman comic writers were Plautus and Terence, whose plots were mainly derived from the Greek. See Drama; Literary Forms.

COMEDY OF ERRORS, The. This, Shakespeare's shortest play, is certainly one of his earliest. Conservative modern critics are inclined to fix upon 1591 as the probable date of composition and to place it second only to ‘Love's Labour's Lost’ in the order of the poet's independent works. To the general reader the comedy is chiefly known as Shakespeare's solitary effort at direct imitation of a classic model; and the neglect it suffers may be due to the mistaken notion that it is no more than a free rendering of the ‘Menæchmi’ of Plautus. The idea of the indistinguishable Antipholus twins and the rough pattern of their adventures, to be sure, come from the ‘Menæchmi,’ and certain other points from a second Plautine play, the ‘Amphitruo’ — notably the situation in Act III, scene I, where the true master and his slave are shut out of their house while their doubles revel within. Both in plot, however, and in development the Shakespearean play invents more than it borrows, and it deserves respect as an instance of the same kind of treatment of sources which marks the poet's maturest work. Short as it is, ‘The Comedy of Errors’ is vastly richer and more varied than the ‘Menæchmi.’ The clever notion of duplicating the twin Antipholi by twin servants (the Dromios) trebles the opportunity for mirthful misunderstanding; while the creation of the pathetic figures of the old father and mother and the charming sister-in-law, Luciana, introduces a depth of human feeling and a romantic atmosphere entirely alien to Plautus. The reader of ‘The Comedy of Errors’ will find many suggestions of later plays. Compare the old father Ægeon with Egeus in ‘A Midsummer Night's Dream’; the business of the chain with the trouble over the ring in ‘The Merchant of Venice,’ and note particularly the forecast of ‘Twelfth Night’ in the story of the escape of the shipwrecked twins, their subsequent confusion and the episode of the supposed madman bound and laid in a dark room. An English translation of the 'Menæchmi' was printed in 1595 and may conceivably have been accessible to Shakespeare in manuscript at an earlier date. It seems more likely that he got his general knowledge of this play as well as of the untranslated 'Amphitruo' while at school, where Plautus was often a regular subject of study. For the influence of Plautus on English drama in the 16th century, consult the introduction to M. W. Wallace's edition of 'The Birth of Hercules' (Chicago 1903). The 1595 translation of the 'Menæchmi,' with parallel Latin text and introduction, has been edited by W. H. D. Rouse in the 'Shakespeare Classics Series' (New York 1912).

Tucker Brooke,
Assistant Professor of English, Yale University.

COMENIUS, kō-mē'nĭ-ŭs, or **KOMENSKY, Johann Amos**, Moravian educational reformer: b. probably at Nivnitz, Moravia, 28 March 1592; d. Amsterdam, 15 Oct. 1671. His family belonged to the sect of Moravian brethren. He studied at Herborn in Nassau and at Heidelberg. He became rector of a school at Prerau and later, after taking orders in the Church of the sect of his parents, accepted the position of pastor and rector at Fulnek. The plunder of that town by the Spaniards after the battle of Prague in 1620 cost him all his possessions and writings. He fled to Poland, where in 1632 he was elected bishop of his communion at Lissa. Here in 1630 was published his 'Pansophiæ prodromus,' a work on education which attempted to organize all human knowledge within reach of the minds of everyone. In 1631 there appeared his 'Janua Linguarum reserata,' which outlined his method of teaching languages through the vernacular and by means of illustrations and object lessons. This work obtained widespread popularity and was translated into many European languages as well as into Persian, Arabian and Mongolian. His 'Orbis pictus' was an abridgment of the 'Janua' with many illustrated cuts for use by children, and was the first of its kind. In 1638 he went to Sweden to plan a system of education for that country. In 1641 he visited England on a similar mission which was unsuccessful because the political upheaval made the time unripe for reforms of that sort. He therefore returned to Sweden in 1642, and, with the assistance of Oxenstjerna, worked on plans for the curricula and management of the Swedish schools. At Elbing, in West Prussia, whither he went in the same year, he worked on further elaborations of his schemes; and then continued both this and his religious duties at Lissa (1654). In the war which followed, he again lost all his manuscripts, and was obliged to flee. He went to Amsterdam, where he remained for the rest of his life.

His educational theories were remarkably broad and inclusive. His system of schools has not yet been superseded in practice. His efforts were directed toward arousing the interest of the pupil. In his curricula, music, economy, politics, world history and science were included. Education was to him a means of interpreting and enlarging every-day experience by use of its own terms as well as by means of the classics, religion and ethics. His writings on education are numerous. 'Didactica Magna,' the most comprehensive of his publications, reveals his attempt to make a science of education by approaching it by the same method as that employed by the physical sciences. At the celebration of his tercentenary, a society was formed for the publication of his works. His place in the history of educational reform is well merited in spite of the weaknesses of his scientific bases.

As a theologian he was mystical, a believer in prophecies, dreams and revelations. Among his works in this field are 'Synopsis physicæ ad lumen divinum reformatæ'; and 'Lux in tenebris,' a prophetic work. Consult Laurie, 'John Amos Comenius' (1881); Keatinge, 'The Great Didactic of Comenius' (London 1896), and Monroe, 'Comenius and the Beginning of Educational Reform' (New York 1900).

COMET (Greek, "hair," alluding to the luminous appendage or tail with which the brighter comets are always associated, and which formerly won for them the name of "hairy stars"). Comets may for convenience be divided into two classes, periodic and unexpected. From 2 to 3 of the former, and from 3 to 4 of the latter, appear on the average every year, but the number varies greatly. In 1898 as many as 10 were discovered, 5 being found in 12 days. Of the 10, 7 were unexpected.

Every comet, no matter how magnificent it may subsequently be, when first discovered, if remote from the sun, appears as a small, very faint, hazy ball. As it comes nearer it becomes brighter, and generally larger, although sometimes it contracts in size. If it is going to be a fine comet it gradually lengthens out, and develops a short tail. The tail rapidly brightens and lengthens as the comet approaches perihelion, as the point in its orbit is called where it is nearest the sun. If the earth is favorably situated the comet appears at its best a few days after the passage of perihelion, and then gradually fades out and disappears as it came. About one unexpected comet in eight is visible to the naked eye. The periodic comets move in elliptical orbits about the sun in planes not in general greatly inclined to the ecliptic. The longest period so far definitely known, that of Halley's comet, is 76 years. The unexpected comets have still larger orbits, lying in all planes, with much longer periods. Many of them have a retrograde motion, and occasionally one visits the sun never again to return to it. When an unexpected comet arrives, its orbit is first computed from three observations made on different nights, on the assumption that it is moving in a parabolic orbit. If we are able to observe it through a long period we frequently find that its path differs slightly from a parabola. It is not likely that any comet moves in an exact parabola. If it moves a little slower than the parabolic velocity, its orbit is an ellipse, and the comet really becomes periodic, although it is not classed as such until it has been certainly identified at another return. If it moves a little faster than the parabolic velocity, its orbit is a hyperbola, and the comet will recede into space never to return.

Should a comet happen to pass near one of the larger planets, its orbit may be somewhat changed by the approach and its speed may be either increased or diminished. In this manner new members of the periodic class of comets are from time to time added to the list. On the other hand, its velocity may be so far accelerated as to change its orbit, or even drive it out of our system, never to return to it. In this way some of the members of our periodic family of comets are subject to change; others, however, have been permanently added to the solar system. Out of 33 well-known periodic comets 24 have, or did have, periods lying between five and nine years. Many of these were doubtless brought into our system by the giant planet Jupiter. Some of them have already disappeared, owing to a change in their orbits, while some have lost a large part of their gaseous constituents and thus become invisible.

This last statement naturally brings us to the question, What is a comet? In early times comets were supposed to be objects within our own atmosphere, presaging famines, wars and the death of kings. It was first shown by Tycho Brahe that they were celestial bodies independent of the earth, and Newton proved that, excepting their tails, they were bodies subject to the law of gravitation. In the middle of the last century it was shown by H. A. Newton, Schiaparelli and others that our chief meteoric showers, those of 10 August and 14 November, were due to great swarms of meteoric bodies moving in elliptical orbits, practically coincident with the orbits of two well-known periodic comets, 1862, III (Tuttle's), and 1866, I (Tempel's).

In several instances two or more comets are known to be following practically the same path, and it was but a step from this to see that the head of a comet was only a concentrated swarm of meteors. It is only within the last few years, however, that we have begun to understand the nature of a comet's tail. That it is matter in a state of extreme tenuity is obvious, since, when millions of miles of it is interposed between us and the faintest stars, they are still visible and practically undimmed. What has puzzled astronomers since the time of Newton, however, is the fact that while all other bodies in the sidereal universe, as far as we are aware, obey the law of gravitation, comets' tails are clearly subject to some strong repulsive force, which drives the matter composing them away from the sun with enormously high velocities. The tail, therefore, always lies outside of the comet's orbit, being somewhat behind the comet when the latter is approaching the sun, and somewhat in advance of it when the comet is receding.

That the tail is gaseous is proved conclusively by the spectroscope, also that it is in an extremely rarified condition; but why the extremely small particles which constitute a gas should act in any way differently under the law of gravitation from the larger meteoric masses which constitute the head of the comet is not at first sight obvious. If, however, we consider the matter carefully, we shall see that if all objects are attracted to the sun in proportion to their mass, and repelled from it in proportion to their surface, then the attraction will vary as the cube of the diameter of the objects and the repulsion as the square. For objects of ordinary size the repulsion is so slight that we cannot detect it; but if the object becomes gradually smaller, the attraction of the mass will diminish much more rapidly than the repulsion on the surface, and a time will come when they will be equal, and if the particle becomes still smaller, the repulsion must exceed the attractive force. It therefore becomes evident that if such a repulsive force existed, and if the gaseous molecules were sufficiently small, we should have an effect exactly like that which we observe.

It has been shown by J. J. Thomson ('Proceeding of the Royal Society,' LVIII, No. 350) that if hydrogen gas is electrified positively, the green line in its spectrum will be brighter than the red, and, on the other hand, if negatively charged, the red will be brighter than the green. In the case of the sun the red is the brighter line, so that we may infer that the solar surface is charged negatively.

It is a well-known fact that if the ultraviolet rays of the spectrum be allowed to fall upon a metallic body little corpuscles or electrons leave the atoms forming the metallic body and fly away from them with enormous velocity. These corpuscles either carry a negative charge of electricity, or what is perhaps more probable, constitute the negative electricity itself. The atoms lacking these corpuscles are as we usually express it positively charged.

Surrounding the meteor swarm and with it forming the comet's head is a mass of gas. When a flying corpuscle comes in contact with a molecule of this gas the two unite, the molecule becomes negatively charged, and both being repelled by the negatively charged sun, recede from it. The subject will be found treated in more detail by R. A. Fessenden, *Astrophysical Journal*, III, 36. He there computes the potential of the sun's surface at about 15,000 volts. According to Arrhenius and Thomson the corpuscles which constantly deliver a negative charge to the earth, and would therefore also deliver it to a comet, proceed directly from the sun. The tail probably receives a charge from both these sources, but the latter would seem to be much the more effective of the two.

The question may now naturally be asked, since there is an abundance of extremely rarefied gas at an altitude of a few hundred miles above the earth's surface, and since we too are exposed to the flying corpuscles, why is not the earth itself provided with a comet-like tail? In answer we reply that at certain times it is. 'Annals of Harvard Observatory,' XXXII, 288. Our great auroras are indeed nothing else than the appearance of a small cometary tail. These great auroras, which exist at an altitude of several hundred miles, and envelope the whole earth, must not be confounded with the small but intensely brilliant local auroras always existing at low altitudes in the polar regions.

The reason that these great auroras only reach an altitude of a few hundred miles, instead of several millions, like the tail of a comet, is on account of the great mass of the earth, which does not permit the electrified gases to escape from it. The great auroras exhibit two notable characteristics. They appear only when the electro-magnetic condition of the sun is greatly perturbed, and they are most conspicuous at those times when the earth is approaching or receding most rapidly from it; that is, at the end of March and September.

The same appears to be true of comets. The longest tails belong to those comets that approach closest to the sun's surface, and accordingly approach and recede from it with the greatest rapidity. Of the comets that do not approach remarkably close to the sun's surface, those which come during years of great solar activity are more likely to be provided with long tails than those coming when the solar surface is quiescent. Of the past 62 years during which sun spots have been recorded, 31 have been classed as of greater, and 31 as of less, solar activity. If the sun's activity had no influence upon a comet's tail, we should expect that an equal number of comets provided with long tails would have appeared in each of these intervals of 31 years. During the 62 years 10 comets have appeared that were furnished with long tails, and yet did not pass within 10,000,000 miles of the sun's surface. Of these, seven came during the years of great solar activity, and only three during those of less. From this we see that comets' tails, like our auroras, other things being equal, appear to be more pronounced during years of great solar activity.

Since the electric current spreads out from the nucleus on all sides as it recedes from the sun, there must, by the well-known laws of currents, be a rotation produced by the magnetic force of the sun acting upon the current ('Annals of Harvard Observatory,' XXXII, 275). The tendency would be for the tail to revolve about its axis, in one direction, if located north of the sun's magnetic equator, and in the other direction if located south of it. Such a rotation has in fact been observed in the case of the bright comets of 1825 IV, 1835 III (Halley's) and 1892 I (Swift's).

Quite recently another explanation of comets' tails has been given by Arrhenius. He attributes the recession of the particles forming the tail, however, to the repulsion of light. It was first shown mathematically by Maxwell that light must exert a slight mechanical pressure upon all bodies above a certain size that are exposed to it. Gaseous molecules are too small to be affected by it. In the case of large bodies it would be concealed by the overwhelming attraction of gravitation. In order to be repelled from the sun, particles having the density of water must have diameters lying between 1-1000 and 1-14000 of a millimeter, or between 1-25000 and 1-350000 of an inch. For particles of greater specific gravity the dimensions will have narrower limits.

It is most likely that several causes combined produce the observed repulsion of the tail. Several of these are suggested by Nichols and Hull in their article describing their attempt to produce an artificial cometary tail (*Astrophysical Journal,* 1903, XVII, 352). It was shown in the 'Harvard Annals,' XXXII, 288, that the gaseous spectrum persisted in the tail of Swift's comet to a distance of 3,000,000 miles from the head. The presence of dust would be indicated by reflected light giving the solar spectrum. On account of the faintness of the tail we should hardly expect to distinguish the solar lines, but a distribution of photographic intensity in the spectrum similar to that which we find in the sun might be accepted as evidence of the presence of dust in the tail. Such a distribution was found in the case of the bright comet of 1881 III.

We may therefore say that the most probable explanation of a comet is that the head consists of a more or less concentrated swarm of meteors enveloped in gas and dust and that the tail is a current of gas and sometimes dust proceeding from the head, being most pronounced when the comet crosses the greatest number of electro-magnetic equipotential surfaces.

The shape and size of the tail enable us to compute the intensity of the repulsive force causing the tail to recede from the sun. This was done by Bredichin, who divided all comets' tails into three classes according to the sharpness of their curvature, and suggested that the sharpness of the curve indicated the atomic weight and therefore the general chemical constitution of the matter forming the tail. This last suggestion is open to doubt.

More recently, by means of photography, we have been enabled to detect condensed areas in the tails of certain comets, and by comparing the photographs upon successive nights we have measured directly the speed of recession of the particles forming the tail from the head of the comet. Two comets so far have been measured in this manner that of 1892 I (Swift's), by the writer, and that of 1893 II (Rordame's), by Hussey. For the comet of 1892 the repulsive force was 39.5 times that of gravity. In the case of the comet of 1893, the repulsive force was 36 times as great ('Pub. Astron. Soc. Pac.,' VII, 185), portions of the tail at times receding with a velocity exceeding 150,000 miles an hour. A remarkable behavior of a part of the material composing the tail was observed in the bright comet, Moorehouse, during the month of October 1908. Two great cloudlike knots appeared, an approximately normal, fan-shaped tail extending outward from the first knot, and the second being merely connected to the comet's head by a narrow band of luminous matter. It was evident that for some cause the great repulsion of material had almost ceased for a short time; the matter already expelled and forming the first condensation had receded some distance when a second active repulsion took place, thus pushing away the second condensation. The latter was found to be receding with a speed of 99,000 miles an hour, which was 10,000 miles greater than the rate of recession of the first. It was this fact, combined with the forward motion of the comet itself in its orbit, that caused the two clouds of material to be seen later side by side in the interrupted tail. It has become evident from this and from several other anomalous cases that comets' tails are not due to simple light pressure, or to the comets passing steadily into regions of higher or lower electric potential, but that the full causes must be of a very complicated nature.

Since the gaseous particles receding from a comet's head can never again return to it, and since a comet is visible to us chiefly, and generally wholly, by the electrical illumination of this gaseous medium, it is clear that a comet must become less and less luminous after each return to the sun. But not only does it become less luminous on account of the loss of the material forming its tail, but the meteors composing its head likewise become more and more widely distributed along the course of its orbit. This is in part due to the positive charge left by the tail, which neutralizes the gravitation — or pull of the various portions of the comet's head for one another — and therefore permits those portions of the meteoric swarm which are nearest to the sun to move at a higher speed than those portions which are more remote.

In some cases, like our August meteors, the distribution extends throughout the orbit, with but one luminous condensation, known as the comet of 1862 III. In other cases there are two or more condensations. Thus Biela's comet was seen to split into two parts. Four distinct comets were found following in the track of the great comet of 1668.

We must now discuss the important question of the origin of comets. It is known that the sun, with its attendant planets, is traversing space in the direction of the constellation Lyra at a speed of about 11 miles per second. If comets come from remote interstellar space, or from the other stars, it is obvious that we should meet more comets coming from Lyra than would overtake us coming from the opposite direction. Also that those comets we met would have a greater velocity relative to the sun than would those that might overtake us. Nothing of the sort is found, however — the distribution is uniform in all directions. There is but one conclusion to be drawn from this, and that is that all the comets that we have observed possess the same common speed as the sun, omitting relative motion, and travel in the same direction. In short, they are all of them parts of the same original gaseous mass from which the solar system condensed, being merely those portions which were originally left on the outside, before the great common rotation was established, and which now occasionally drop in toward the centre, and then fly back again to their original position on the outskirts of the system. The normal path of every comet is therefore an ellipse. If the paths of some comets have become slightly hyperbolic through the action of some outside body, they can never again visit the sun. As we have just seen, a comet not belonging to our system would be most likely to approach us from the general direction of the constellation Lyra, with a high hyperbolic velocity. We are acquainted with the orbits of about 400 comets, but no such body is certainly found among them.

From this point of view it is interesting to determine of what chemical elements comets are composed. To this the spectroscope gives a ready answer, and shows that by far the most common elements are hydrogen and carbon in chemical combination. This answer, however, is only a partial one, because most comets do not approach sufficiently near to the sun to enable their more refractory elements to be volatilized. The bright small comet of 1882 I (Wells') approached so close to the solar surface that the distance at perihelion amounted to only about 5,000,000 miles. Some of its metallic constituents were accordingly vaporized, the most prominent of them being sodium. The great comet of 1882 III approached within 300,000 miles of the sun's surface. This was so near that not only the sodium but even some of the iron lines appeared in its spectrum. This is what we should have expected, judging by the chemical composition of most of the meteors that reach the earth's surface. We thus see that incidentally comets are able to give us information regarding the temperature that bodies would attain at different distances from the sun. When the metallic lines are present in the spectra of these comets the carbon bands vanish. This is precisely the effect that is produced in our laboratories when the cause of the illumination is an electric current. The current by preference selects the molecules which are the best conductors. If the illumination of the comet were due merely to heat, there is no reason why the carbon bands should have disappeared.

Few persons now living remember distinctly the great comet of 1843. It appeared suddenly in the northern hemisphere about the middle of March, and was not long visible. It was notable for the great length of its tail and its small perihelion distance,— the smallest on record. This amounted to only 511,000 miles. Its centre therefore came within 78,000, and the nearer side of its head within 32,000, miles of the sun's surface.

The great comet of 1858, known generally at Donati's, was a magnificent object. Not only was it a fine comet in itself, but it seems as if everything conspired to enable it to be well seen from the earth. It was a most conspicuous object in the northern sky during the early evenings in October, and was nearest us shortly after the passage of perihelion. Its tail reached a length of 60 degrees and swept as a broad curved plume across the heavens. It was visible for several months, which enabled it to be carefully observed, and there is no doubt but that it moves in an elliptic orbit. Its period is about 2,000 years.

The great comet of 1861 was discovered by Tebbutt in Australia. It appeared suddenly in the northern hemisphere at the end of June and, according to Sir John Herschel, was the brightest comet of the century up to that time. It was not long visible.

The great comet of 1882 was remarkable on many accounts. In the first place it was shown to be one of a group of five comets all following nearly in the same orbit. The four others were those of 1668, 1843, 1880 and 1887. The last was comparatively inconspicuous, but the others were all notable. The nucleus of the comet of 1882 moreover showed a tendency to fall apart, five different condensations in it being visible at once. Schmidt, Barnard and Brooks all noticed small companion nebulosities in the immediate vicinity of the comet and moving with it. It was visible for about nine months — an unusually long interval, and in this time it traversed 340 degrees of its orbit. It clearly follows an elliptical path with a period which lies between 772 and 1,000 years. The tail was very extraordinary. It measured about 200,000,000 miles in length, and was strongly forked at the end. Moreover it was accompanied by a clearly seen but filmy sheath of light, extending three or four degrees toward the sun. The whole comet was surrounded by an elliptical envelope of enormous dimensions and of a still more filmy nature. That this most remarkable object was not more generally observed by the public is due undoubtedly to the fact that it was visible only in the early morning hours. It was certainly the brightest comet of the century, and it was so bright that it was watched in perihelion passage until in contact with the sun's limb, when it suddenly disappeared, being of too filmy a nature to be detected upon the sun's surface. For three days it was visible to the naked eye with the sun above the horizon. There have been so far 14 different comets placed on record which were bright enough to be seen under these circumstances.

Turning now to the periodic comets; by far the finest is Halley's. Our first record of it is in the year 11 B.C. Since then it has appeared regularly every 76 or 77 years, in all 25 times. We have a drawing of it as it appeared in 684, and another drawing of it in 1066. During its latter appearance it was considered to be the precursor of the conquest of England by William of Normandy. It was a magnificent object in 1145, and again in 1223, when it was supposed to foretell the death of Philip Augustus of France. In 1456 it was a superb object appearing shortly after the Turks had taken Constantinople. In 1682 it was observed by Halley, who computed its orbit, and showed that it was identical with the great comets of 1531 and 1607, and predicted its return for the end of 1758 or the beginning of 1759. This is the first time that the return of a comet was ever predicted, and although Halley knew that he could not expect to live to see his prediction fulfilled (he was born in 1656), yet he left a somewhat plaintive appeal to posterity, that in case the comet should reappear, it should be remembered that this first prediction was made by an Englishman. The comet appeared Christmas day 1758. At its next appearance, in 1835, the comet was a fine object, but did not correspond in brilliancy to the descriptions of some of its earlier apparitions. This may perhaps he explained by the fact that it was but two years after a sun-spot minimum. Its next appearance was in 1910, which was also unfortunately very near a sun-spot minimum. But very likely the chief reason for its relative faintness in 1835 is that the material which formed the tail has been largely used up by its frequent visits to the sun, and that it will thus never again present the brilliancy of its past appearances. An account of its last appearance is given below.

The following table of the elements of the orbits of the periodic comets has been condensed and brought up to date from Holden's tables of periodic comets:

TABLE OF THE MOST IMPORTANT PERIODIC COMETS

T	ω	Ω	i	q	a	U	e	
1910 April 20............	111°	55°	162°	0.59	17.99	76.29	0.97	Halley.
1905 Jan. 11............	184	335	13	0.34	2.22	3.30	0.85	Encke.
1904 Nov. 10............	186	121	13	1.35	5.28	5.28	0.54	Tempel II.
1903 Dec. 6............	344	18	6	1.96	3.69	7.10	0.47	Brooks.
1884 II. Aug. 16............	301	5	5	1.28	3.08	5.40	0.58	Barnard.
1879 I. Mar. 30............	15	101	29	0.59	3.10	5.47	0.81	Brorsen.
1891 V. Nov. 15............	107	296	5	1.09	3.13	5.53	0.65	Tempel—L. Swift.
1886 IV. June 7............	177	54	13	1.33	3.15	5.60	0.58	Brooks.
1898 II. Mar. 20............	173	101	17	0.92	3.24	5.72	0.72	Winnecke.
1894 IV. Oct. 12............	297	49	3	1.39	3.25	5.86	0.57	De Vico—E. Swift.
1879 III. May 7............	160	79	10	1.77	3.30	5.98	0.46	Tempel I.
1892 V. Dec. 11............	170	207	31	1.43	3.38	6.23	0.58	Barnard.
1890 VII. Oct. 26............	328	45	13	1.97	3.45	6.40	0.47	Spitaler.
1896 VII. Nov. 25............	164	247	14	1.11	3.46	6.44	0.68	Perrine.
1896 V. Oct. 26............	140	192	12	1.48	3.50	6.55	0.58	Giacobini.
1852 III. Sept. 23............	223	246	13	0.86	3.53	6.62	0.76	Biela (I and II).
1893 III. July 12............	316	52	3	0.99	3.53	6.62	0.72	Finlay.
1897 II. May 24............	173	146	16	1.32	3.55	6.68	0.63	D'Arrest.
1898 IV. July 5............	173	206	25	1.60	3.60	6.82	0.56	Wolf.
1900 III. Nov. 28............	172	196	30	0.93	3.62	6.66	0.74	Giacobini.
1899 II. April 28............	14	332	21	2.14	3.62	6.87	0.41	Holmes.
1895 II. Aug. 21............	168	170	3	1.30	3.68	7.06	0.65	L. Swift.
1894 I. Feb. 10............	46	84	6	1.15	3.80	7.42	0.70	Denning (II).
1896 II. Mar. 19............	201	210	11	1.74	3.85	7.57	0.55	Faye.
1889 VI. Nov. 30............	70	331	10	1.35	4.18	8.53	0.68	L. Swift.
1881 V. Sept. 13............	312	66	7	0.72	4.23	8.69	0.83	Denning (I).
1899 III. May 4............	207	270	54	1.02	5.74	13.66	0.82	Tuttle.
1866 I. Jan. 11............	171	231	163	0.98	10.32	33.18	0.90	Tempel.
1867 I. Jan. 20............	358	78	18	1.58	11.71	40.09	0.86	Stephan.
1852 IV. Oct. 13............	57	346	41	1.25	15.44	60.7	0.92	Westphal.
1884 I. Jan. 26............	199	254	74	0.78	17.2	71.56	0.96	Pons-Brooks.
1887 V. Oct. 8............	65	84	45	1.20	17.4	72.65	0.93	Olbers.
1846 IV. Mar. 6............	13	78	85	0.66	17.90	75.7	0.96	De Vico.

The question is often asked the astronomer, what would happen if the earth should come into collision with a comet? As far as the tail is concerned, that is probably a frequent occurrence. It happened twice during the last century, in the case of the comets of 1819 II and 1861 II, and it probably occurred also during the apparition of Halley's comet in 1910, but in no case were any particular effects observed. Should we come into contact with the head of a small comet there would undoubtedly be a fine meteoric display. That is in fact what probably happened in 1833, and also on a number of previous occasions, notably in 472, 902, 1029, 1202 and 1799, although the comet itself was not luminous. If the comet were moving rapidly with regard to the earth, as in these cases, the meteors would be consumed at a great altitude in our atmosphere, and no harm would be done. If the comet were moving in the same direction as ourselves, however, and at about the same speed, the matter would then become more serious, as many of the meteors might reach the earth's surface.

The self-luminous, and therefore visible comet, which has come nearest to the earth, as far as we are aware, was that of 1770 I (Lexell's). It approached within 1,400,000 miles, or six times the distance of the moon. Its head appeared about four times the diameter of the moon, but its mass was imperceptibly small. Should the earth strike the nucleus of a great comet, like that, for instance, of 1858, it is impossible to foretell what would happen, but possibly the temperature and shock would be such that all life within several thousand miles of the point of contact would become extinct. Considering the vast recesses of celestial space, however, and the insignificant size of our earth, the probability of such an encounter is almost infinitely small.

For a more detailed account of the individual peculiarities of the more interesting comets, see Clerke's 'History of Astronomy'; Chambers' 'Story of the Comets' (1910).

William H. Pickering,
Harvard College Observatory.

COMET, in ornithology, one of a group of humming-birds with long forked tails. One of the most imposing of all humming-birds is the Sappho comet (*Cometes Sappho*), or bar-tailed humming-bird, native to Bolivia, but migratory, and in the winter generally visiting eastern Peru. Specimens are secured only with great difficulty, owing to the rapidity of the complex evolutions of the bird when on the wing. Mounted examples, gorgeous as they are, do not convey an adequate idea of the brilliancy of the plumage. The Phaon comet (*Cometes Phaon*) is equally magnificent, but larger. It also inhabits Peru and Bolivia. It is distinguished from the Sappho comet by the fact that the tail is wholly crimson red, while that of the Sappho comet is ruddy brown at the base and is tipped with a black band. See Humming-Birds.

COMETAS, called Scholasticus, Greek author, generally assigned to the 9th century A.D., although his time is doubtful. There are extant of his works a paraphrase of part of the 11th chapter of Saint John's Gospel, in 57 hexameter verses, and six epigrams in the Greek Anthology. It appears from some of these epigrams that he made a new rescension of the Homeric poems, effecting radical changes for the better in the punctuation. Clemens Alexandrinus refers to a Cometas of Crete as a commentator on Homer. By some he has been identified with the Cometas who was made professor of grammar at Constantinople in 856.

COMETS, 1910A and Halley's.— During the year 1910 two brilliant comets appeared which excited world-wide popular interest — the first being a new comet known as 1910A, the second the celebrated comet of Halley. We shall add a brief account of these remarkable objects. Comet 1910A belonged to the group of great southern comets, and was discovered in South Africa about 15 January. On 16 January the startling news that a comet visible to the naked eye was near the sun was cabled to Europe by Director Innes of the Transvaal Observatory in Johannesburg, and thence telegraphed to all observatories. Wherever the weather was clear astronomers scanned the region about the sun with eager interest, as this was the first naked-eye comet to appear so suddenly since the great comet of 1882, which also was a southern comet, announced in the same way. At Lick Observatory, California, the comet was promptly observed by Aitken and Wright, the latter working with the spectroscope and finding an abundance of sodium vapor in the brilliant head, which rivaled Venus in splendor. It was also observed at the Lowell and Harvard observatories; and at the Yerkes Observatory by Barnard, as well as at several observatories in Europe. In a few days an orbit was computed by Kobold, editor of the *Astronomische Nachrichten*, in Kiel, Germany. This showed that the comet had passed perihelion on 17 January, at a distance of some 4,000,000 miles from the sun's centre, and would rapidly decrease in brightness. The passage so near to the sun had exposed the comet to a terrific radiation and produced the brilliant tail with sodium vapor in the head. During the latter part of January and early part of February the comet hung in the western sky in the form of a great plume, with curved tail some 30 degrees long; and it was observed by all classes of people on sea and land. As Halley's comet was expected and had been much talked of, 1910A was at first taken to be this celebrated historical object; but the confusion of thought was soon removed, and the new comet popularly described as a «tramp» comet which had unexpectedly come along, and occupied the centre of the stage months before Halley's comet hove in sight to the ordinary citizen watcher of the skies.

The question may be asked: Why did not astronomers detect 1910A till it got so near the sun? To this we answer that the comet had approached the sun from behind, and thus it had been constantly obscured by the sun's rays, and only became visible when its head had attained splendor comparable to that of the planet Venus. Comets which approach the sun from the further side usually are invisible unless they are quite brilliant. On more than one occasion astronomers have been astonished at noticing a small comet near the sun during a total eclipse; but where it is not brilliant enough to observe by daylight, even with the telescope, such an object is again lost as soon as the eclipse is over, and thus the orbit of such eclipse comets cannot be determined.

The apparition of Halley's comet during 1910 had long been looked forward to by astronomers. Some three years before the expected return, astronomers Cowell and Crommelin of the Greenwich Observatory took up the problem of laboriously calculating the effect of the perturbations of the planets since the last appearance of this comet in 1835. These skilful mathematicians calculated an ephemeris which enabled the astronomer to point his telescope toward the region where the comet was known to be long before it got near enough to the sun to become visible even with the most powerful of modern instruments. Finally, on 11 Sept. 1909, Dr. Max Wolf, of the Heidelberg Observatory, photographed the predicted region for Halley's comet, using a wide field, and sensitive plates and long exposure. On developing the plate he found on it a small blotch, the first such record ever made of Halley's comet, photography having been invented since the last appearance of the comet in 1835. The comet was found to be very near the place predicted by Cowell and Crommelin, the outstanding error not exceeding 4 minutes of arc, or one-eighth of the diameter of the moon. This was a splendid triumph for mathematical astronomy.

The place of the comet being thus detected by photography, Prof. S. W. Burnham was able to see it a few days later with the 40-inch refractor of the Yerkes Observatory, Chicago, and it was soon under the scrutiny of hundreds of telescopes in all parts of the world. When first detected Halley's comet was about half way to the orbit of Jupiter; at this great distance both from the sun and from the earth it appeared extremely faint. It was due to pass perihelion 20 April 1910, and astronomers made extensive preparations to observe it over as long a period as possible. Special calculations on the perturbative effects of Mars, the Earth and Venus were made by Professors Leuschner and Crawford, of the University of California, in order to determine the exact time of the expected transit of the comet's head over the sun's disc, 18 May 1910.

The transit of a comet over the sun is a very extraordinary phenomenon — only one other, that of the great comet of 1882, having ever been observed — and as such a thing is not likely to happen more than once in a century, it was felt that every effort should be made to observe it, in the hope of finding out whether there is any solid matter in the head of a comet. The calculations of Leuschner and Crawford showed that the transit would begin a little before 8 P.M. of 18 May, Pacific Standard Time, and thus after the sun had set on the Pacific Coast of the United States; so that the transit could be observed only from the islands of the Pacific and the East Indies and Australia. Mr. Ellermann of the Mount Wilson Solar Observatory was sent to Honolulu to observe the transit; and it was diligently looked for also by Father Algue at Manila, and by several observers in Australia. None of these observers, however, could detect any trace of the comet passing over the sun. In transit Halley's comet must have totally disappeared, just as happened also when the great comet of 17 Sept. 1882 was noticed by astronomers at the Cape of Good Hope to vanish the instant it entered upon the sun's disc, so that they thought it had gone behind the sun. The conclusion to be drawn from the failure of these two comets to become visible on the sun's disc is that the heads of the comets are such rare, unsubstantial masses that they do not sensibly obstruct the sun's light; and that if solid nuclei exist, they must be too small to be noticed. This confirms our general experience that comets are very unsubstantial bodies.

One other result of considerable interest was the detection by Lowell of hydrogen monoxide as the chief constituent of the tail of Halley's comet. Hydrocarbons, cyanogen and other gases were found in the head.

Just before the transit the earth was expected to pass through the tail, and popular alarm existed lest some harmful results might ensue. The length of the tail was at the maximum from 100 degrees to 120 degrees in length. It stretched across the morning sky, from Pisces to Ophiuchus, like a great searchlight, having an extreme width of perhaps 10 degrees. After the transit of 18 May it was still visible for a day or two in the morning sky, which was explained by the usual backward curvature of the tail.

No sensible effect from the passage of the earth through the edge of the tail could be detected, though it was watched for by astronomers throughout the world. Innes of Johannesburg has made it probable that a slight electric charge borne by the earth's atmosphere tended to scatter the tail as it neared our planet, so that hereafter comet's tails will have less terror for the people than heretofore. No harmful effects of any kind from the appearance of Halley's comet could be observed, and popular excitement rapidly died away. Altogether Halley's comet proved to be the most interesting object of this kind which has appeared since Donati's great comet of 1858.

T. J. J. SEE,
Professor of Mathematics, Naval Observatory, Mare Island, Cal.

COMETTANT, kō-mĕt-täṅ, **Oscar**, French musician, composer and author: b. Bordeaux, 18 April 1819; d. Montivilliers 1898. He was a pupil of Elwart and Carafa at the Conservatoire, and first became known as a pianist; he also wrote several works for the piano, duets for violin and piano, and choruses and songs. Among the piano compositions were 'Robert Bruce' and 'Le juif errant'; the vocal included 'L'Alboni' and 'L'Inde révoltée.' For many years he was musical critic of the *Siècle*, and he was also a contributor to the *Ménestrel*, the *Gazette Musicale*, and other journals of music. A great traveler, he visited the United States and wrote a book of impressions, 'Trois Ans aux Etats-Unis' (1857). Among his further works, most of which are marked by a humorous and brilliant style, are 'Les civilisations inconnues' (1863); 'Le Danemark tel qu'il est' (1865); 'La musique, les musiciens, et les instruments de musique' (1870); and 'Francis Planté' (1874).

COMFORT, George Fisk, American scholar and educator: b. Berkshire, Tompkins County, N. Y., 20 Sept. 1833; d. Syracuse, N. Y., 1910. Graduated from Wesleyan University in 1857, he studied archæology and the history of the fine arts in Europe, in 1865–68 was professor of modern languages and æsthetics in Allegheny College (Meadville, Pa.), and in 1868–72 lecturer on Christian art and archæology in the Drew Theological Seminary (Madison, N. J.). In 1872 he was appointed professor of modern languages and æsthetics in the newly-established Syracuse University, where he organized the college of fine arts, of which he was dean from 1873 to 1893. In the latter year he became president of the Southern College of Fine Arts, at La Porte, Tex. He organized the Syracuse Museum of Fine Arts in 1896, and became its director. He was also one of the chief organizers of the American Philological Association, and from 1869 to 1874 its secretary. From 1872 to 1893 he was editor of the art department of the *Northern Christian Advocate*. He also contributed extensively to periodicals, and published 'Art Museums in America' (1869); 'Modern Languages in Education' (1886); 'Woman's Education and Woman's Health' (1894); 'The Land Troubles in Ireland' (1898); and a series of German textbooks.

COMFREY, kŭm'frĭ, the common name of the genus *symphytum* of the natural order *Boraginaceæ* or *Borage* family. There are about 20 species, all natives of the Old World, where many of them are used in household medicine or for forage plants. Attempts have been made to naturalize them in America for commercial purposes, but the experiments have not given much promise of success. There is but one known American species growing wild, *S. officinale,* naturalized from Europe or Asia. It is a coarse perennial weed, from two to three feet high, with flowers in long racemes. The roots are mucilaginous, and are supposed to have medicinal virtues as a cure for diarrhœa. It is known also as blackwort, bruisewort and boneset. In England the leaves, gathered while young, are sometimes used as a substitute for spinach, and some people of unrefined taste eat the young shoots after blanching them by forcing them to grow through heaps of earth. Comfrey stewed in sugar, with a small amount of paregoric added, makes a highly prized domestic remedy for coughs and bronchial irritations.

COMINES, kō-mēn, **COMMINES,** or **COMYNES, Philippe de,** French statesman and historian: b. Comines near Lille 1445; d. Argenton, 18 Oct. 1509. He stood high in the favor of Charles of Burgundy, afterward Charles the Bold, and on occasion of Louis XI's imprisonment by Charles at Péronne, succeeded in bringing about a treaty of peace between them. In 1472 he forsook the cause of the Duke of Burgundy and became councillor and chamberlain of Louis XI, who compensated him so amply for the loss of his property, which had been confiscated by Charles, that he soon became one of the most wealthy and influential noblemen in France. The death of Louis, however, proved fatal to his fortunes. He was no favorite with Anne de Beaujeu, the regent, and was imprisoned on a charge of conspiracy against her. On the accession of Charles VIII, however, he was again employed in the public service, but went into retirement after the advent of Louis XII, who seemed reluctant to favor him, although he left him in possession of a pension. The fame of Comines rests not only upon his astuteness as a statesman, but still more upon his ‹Mémoires,› which give a complete view of the political affairs of his time, and present a vivid picture of the character of Louis XI. They have been frequently printed. Lenglet-Dufresnoy's edition (London 1747) is still sought for, especially on account of its annotations; but the best are those published by Mlle. Dupont (Paris 1840–47); and Chantelauze (1881). Comines figures in Sir Walter Scott's romance of ‹Quentin Durward.›

COMING RACE, The, a story by Edward Bulwer-Lytton, published in 1871. It was a skit at certain assumptions of science; but its clever invention and brilliant treatment, added to the craving wonder of humanity as to what its evolution is to be toward, gave it a large popularity.

COMITAT, kŏm'ĭ-tạt (L. *comitatus*), that which went with or accompanied the name given to administrative districts of some size into which Hungary and Transylvania are divided. In old English law comitatus, of which comitat is a contraction, was a county or shire. The comitatus were the personal followers of the king or earl, and the county or shire was the land of the comitatus or comitat. Hence the present use of the term in various European countries in the sense of a division of land.

COMITIA, kō-mĭsh'ĭ-ạ (Lat. «assemblies»), with the Romans, the assemblies of the people in which the public business was transacted, and measures taken in conformity with the will of the majority. They existed even under the kings. In the time of the republic they were convoked by the consuls; in their absence often by the dictator, the tribunes, and in extraordinary cases even by the pontifex maximus. There were three comitia among the Romans, which were called *comitia curiata, comitia centuriata* and *comitia tributa.* (1) The oldest of these was the *comitia curiata,* so called because in it the people voted by *curiæ* or wards. It consisted exclusively of the patricians, the original ruling class at Rome, and the class to which the name of populus was at first restricted. They were divided into three tribes, the Luceres, Ramnes and Tities, each of which was divided into 10 curiæ, so that there were 30 curiæ who voted in the comitia curiata. (2) The comitia centuriata was a mixed assembly of the patricians and plebeians, in which the people voted by centuries, as these had been formed by Servius Tullius. On the institution of this comitia the principal privileges of the comitia curiata were transferred to it, and in course of time the functions of the latter became a mere formality, so that even before the time of Cicero these were not performed by the curiæ themselves, but by 30 lictors representing them. The rights of the comitia centuriata were thus very important, comprising the right of electing the higher magistrates, the right of passing or rejecting laws proposed to them, the right of deciding upon war on the ground of a *senatus consultum* or decree of the Senate, and the highest judicial power. This comitia could be held only on certain days, and it must be summoned 17 days before the day of meeting. On the day of the comitia itself the presiding magistrate, with an augur, went into a tent before the city in order to observe the auspices. If the augur declared them unexceptionable, the comitia was held; if not, it was postponed to another day. Before sunrise and after sunset no business was transacted in the comitia. The presiding magistrate, on his curule chair, opened the assembly by a prayer, which he repeated after the words of the augur. In earlier times, first the equites, then the centuries of the first class, etc., were called upon to vote. In later times lots were cast for the order of voting. The opinion of the century which first voted was usually followed by all the rest. In the earliest times every century voted verbally; in later times by ballot. What was concluded in each century by the majority was proclaimed by the herald as the vote of this century. The comitia was interrupted if any one in the assembly was attacked by a fit of epilepsy (which was called for this reason *morbus comitialis*), or if a tribune of the people pronounced his veto, and under some other circumstances. (3) The other comitia, the comitia tributa, which was also an institution of Servius Tullius, was essentially plebeian in its nature, for if the patricians were not, as some think, entirely excluded from it, they were in so small a minority that their influence was scarcely felt. It was based upon the division which Servius Tullius made of the whole Roman territory into 30 local tribes, which were afterward increased to 35. Its power was at first very limited, being merely local, but it gradually increased, so that it in the end came to possess the right of exercising electoral, legislative and judicial functions, though not so extensive as those of the comitia centuriata. It had the right of electing only the inferior magistrates; legislatively, it was merely entitled to pass resolutions proposed by the tribunes, which before becoming law had to be sanctioned by the Senate; judicially, it had the right of trying only those who had committed offenses against the majesty of the people, and the only punishment it could inflict was a fine. It might assemble either within or without the walls of the city, but not at a greater distance than 1,000 paces, which was the limit of the power of the tribunes. The comitia centuriata, on the other hand, always met in the Campus Martius. Sometimes the comitia centuriata was mixed with the comitia tributa, but in what manner it is not known. The emperors retained these assemblies for the sake of appearance, but used them only as instruments for the accomplishment of their purposes. Consult Greenidge, ‹Roman Public Life› (London 1901); Botsford, ‹The Roman Assemblies› (New York 1909); Mommsen, ‹Römische Forschungen› (Berlin 1879).

COMITIUM (Lat. «place of assembly»), a square in the ancient city of Rome between the Curia and the Forum, where the comitia curiata (q.v.) met. It contained the original rostrum or speakers' platform.

COMITLÁN, kō-mēt-län′, or **COMITAN**, kō-mē-tän′, Mexico, town in the state of Chiapas, on the Grijalva River, 35 miles southeast of San Cristóbal. It has a magnificent church and is a place of considerable trade. The town is largely engaged in agriculture and cattle raising, but has manufactures of cotton and woolen goods, liquors, etc. It is supported chiefly by contraband trade with Guatemala and British Honduras, as the duties on foreign goods are excessive. Comitlán suffered considerably from the raids of Juan Ortega in 1855–64. Pop. 10,196.

COMITY OF NATIONS (very frequently mentioned by its Latin equivalent, *comitas gentium*), the international courtesy by which effect is given to the laws of one state within the territory and against the citizens of another state. «In the silence of any positive rule,» says Story, «affirming, or denying, or restraining the operation of foreign laws, courts of justice presume the tacit adoption of them by their own government, unless they are repugnant to its policy or prejudicial to its interests.» The comity of nations rests upon common consent of the nations themselves and not upon positive law. In the United States the provisions of the constitution cover explicitly the question of comity between the States of the Union, in Art. IV, Sec. 1, which reads as follows: «Full faith and credit shall be given in each State to the public acts, records and judicial proceedings of every other State.» This, however, only applies where a State has a right to act or render judgment for the federation. Consult Story, ‹Conflict of Laws.›

COMLY, Samuel Pancoast, American naval officer: b. Woodbury, N. J., 13 July 1849. He was graduated at the United States Naval Academy in 1869. He was promoted through the various grades, became captain in 1905 and rear-admiral in 1909. He was on the *Juniata* in the Polaris search expedition of 1874. During the Spanish-American War he was in action at San Juan, P. R., and at the destruction of Cervera's fleet, 3 July 1898. In 1905–07 he commanded the *Alabama* and in 1910 commanded a division of the Atlantic fleet. In 1910–11 he was on court-martial duty and was retired in the latter year.

COMMA, the stroke or mark used in writing and printing to separate from each other phrases and clauses in a sentence. The word is of Greek origin and is the noun of the verb *kopto*, to cut; hence literally comma is section, and in grammatical works written in Greek and Latin *comma* or its diminutive *kommation* means a clause in a period as well as the punctuation mark, and in prosody the cæsura. In German typography the punctuation mark comma is a downward short stroke from right to left (/).

COMMA BACILLUS. See CHOLERA.

COMMAGENE, kŏm-a-jē′nē, in ancient times a district in the north of Syria, bounded on the east by the Euphrates, on the north by Mount Amanus and on the west by Cilicia, for some time attached to the kingdom of the Seleucidæ, but afterward for more than 100 years an independent state. It seems to have become independent about 100 B.C., and on the death of its fifth king, Antiochus III, in 17 A.D., it was made a Roman province. It was again for a time allowed by the Romans to hold a position of nominal independence, but was reduced to a Roman province by Vespasian, 73 A.D.

COMMANDER-IN-CHIEF, the supreme commander of the united forces of any country. In the United States the President is commander-in-chief of the army and navy, and of the militia of the several States when the latter is in the national service and forms part of the national provisional army. In all other cases the governor of each State is the commander-in-chief of the State troops. In England he is officially called the officer commanding-in-chief. He is the head of a department of the military administration. He acts, under the Secretary of State for War, as the head of the army, and when military operations are undertaken on a sufficiently large scale to require his presence, is charged with the duty of commanding the army in the field, though, as a matter of fact, this very rarely occurs. In Germany the emperor is the supreme commander-in-chief of the army and navy. The British sovereign, while he talks of «my army and my navy,» has little or nothing to do with the chief command of military or naval matters, which are in the hands of a war council. Even the title of commander-in-chief of his majesty's forces was abolished in 1904; since which date there has been no holder, in deputy, of the once regal title of commander of the forces on land and sea of the nation. The Secretary of State, as head of the war council, is now responsible to the Crown and Parliament for the conduct of military affairs.

COMMANDER OF THE FAITHFUL, a title assumed by the Caliph Omar, father-in-law of Mohammed, and retained by his successors. See CALIPH.

COMMANDER ISLANDS, two islands belonging to Russia lying east of Kamchatka in Bering Sea. The larger, Bering Island (q.v.), lies nearest the coast; the other island of the group, Miedni, is nearly 30 miles long but narrow; it is sometimes called Copper Island, because copper is found there in small quantities. The climate is mild and there are few inhabitants.

COMMANDERY. (1) Among the Knights Templar, Hospitallers, etc., a district under the administration and control of a member of the order, called the commander or preceptor, who received the income of the estates within that district, expending part for his own use and accounting for the rest. In England more especially applied to a manor belonging to the Knights Hospitallers or Knights of Saint John of Jerusalem. These establishments formed at the same time branches. On the first creation of these (branch) establishments they were denominated Preceptories, the superior being called the preceptor; but eventually the name became changed to that of commandery by which they were always afterward known. The council reserved to themselves the power of at any time recalling a commander from his post and substituting another in his place, he being merely considered as the steward of their property. Time, however, gradually wrought a great change in the relative position which the commanders held to the council; and, eventually, a nomination to a commandery came to be considered in the light of a legal acquisition, subject only to the payment of a certain amount of annual tribute to the public treasury, which tribute received the name of Responsions. (2) A regular assembly of Knights Templar, which confers certain degrees. Consult 'History of Knights of Malta.'

COMMANDING OFFICER. (1) In military service, the senior officer of a regiment, corps, post or detachment, where there is no higher local authority, is regarded as the commanding officer. (2) The officer in actual command of a vessel of war. He is an officer of the executive corps and is usually addressed by the courtesy title of «captain» without regard to actual rank, provided he is permanently in command and not in charge temporarily during the absence of a senior. The commanding officer of a modern battleship is responsible for the safety of ship and crew and for the proper care of batteries, engines and other machinery.

COMMANDITE, kŏm-mŏn-dēt', **En,** a term used in France, primarily for a partnership or firm, in which one advances the funds, while another devotes his skill and assiduity; but by extension, a copartnership en commandite oftener means a company for manufacturing or trading, «with limited liability.» In terms of French commercial law, those whom we would call the sleeping partners or silent partners in such associations are denominated commanditaires. Their names do not appear in the nominal title of the firm; they may assist it with their counsel, but they cannot order or sign for its benefit, nor act overtly for it in any way; on the other hand, they are not bound to incur a final loss in case of its failure, beyond that of the entire sum they have advanced, should indeed such be needed to satisfy the claims of agents and creditors. For all details on the rights and obligations of commanditaires, consult the French 'Code de Commerce,' articles 23–28.

COMMELIN, kŏm-lăn', **Hieronymus,** hī-ē-rŏn'ĭ-mŭs. See COMMELIN, JEROME.

COMMELIN, Isaac, Dutch historian: b. Amsterdam 1598; d. there 1676. Among his works the history and description of Amsterdam is still much valued.

COMMELIN, Jan, yän, Dutch botanist: b. Amsterdam 1629; d. 1692. He was for many years a professor of botany in the university of his native city, where with his nephew, Casper, he founded the botanical gardens renowned throughout Europe. He wrote much on horticultural subjects in Latin, the inspiration in some cases being his interest in these gardens over which he exercised a fatherly care.

COMMELIN, Jerome, Flemish printer: b. Douay; d. Heidelberg 1598. He was distinguished by his excellent editions of Greek and Latin classics. His emblem is a figure of Truth, and on many editions the words *Ex Officina Sanct. Andreana.*

COMMELINA, kŏm-mĕ-lī'nạ, or dayflower, is a genus of the spiderwort family (*Commelinaceæ*). It contains about 100 species widely distributed in warm and temperate zones. There are about eight species found in the United States, along streams and in waste places, from Massachusetts to Missouri, southward to Florida and Arizona. The fleshy rhizomes of some species may be eaten when cooked, as they contain much starch and mucilage. In Asiatic countries some are used for medicinal purposes. The plant receives its name from Jan and Casper Commelin, two noted Dutch botanists.

COMMEMORATION ODE. The 'Ode Recited at the Harvard Commemoration' was delivered by James Russell Lowell, 21 July 1865, at the laying of the cornerstone of Memorial Hall, Harvard, and the exercises in honor of the sons of the college who had died in the war for the Union. The choice of a poet for the occasion was a fitting one, for Lowell was a devoted Harvard man, and had suffered serious personal bereavements as a result of the war. In its present form the 'Ode' consists of 12 strophes, but the sixth strophe, on Lincoln, was written after the rest of the poem had been delivered. It sustains a high tone throughout, though there is a certain unevenness which may in part be accounted for by the author's habits of work. While by no means intellectually indolent Lowell was accustomed to postpone the task of actual composition as long as possible, and he was never very successful in revision. In this case he did not begin to write until within 48 hours before the poem was to be delivered, and, except for the addition of the strophe referred to, later changes were not important. From its nature the 'Ode' could show none of the rollicking humor of the 'Fable for Critics' and none of the clever satire of the 'Biglow Papers,' and it lacks something of the youthful energy and enthusiasm that accompanies the idealism of the 'Present Crisis' and the 'Vision of Sir Launfal.' But if it does not show these distinctive characteristics of the author, it is the best expression of Lowell, the dignified scholar and patriot, and as such some of his admirers have ranked it as his best work. Among the finer passages are the tribute to Lincoln, and the third strophe, beginning «Many loved Truth.»

WILLIAM B. CAIRNS.

COMMENCEMENT. In the colleges of the United States this term denotes the day when the students are made bachelors of arts. The degree of master of arts and the degrees of doctors in the professions are also conferred at the same time. The term is given also to the closing exercises of secondary and even elementary schools. The commencement custom is a very old one. Originally it was really a commencement or inception, for the term meant, not the beginning or commencement of a school or term, but the inception of the pupil graduate as a teacher and his recognition as such by his master and other members of the profession. He at once entered upon the duties of his new work; so in this sense the ceremony signified a commencement.

COMMENDAM, kŏm-mĕn'dăm (Lat. *commendare,* that is, to intrust), used in ecclesiastic law to denote the administrative or provisional management of a benefice during a vacancy. The person entrusted with the management is called *commendator.* The grant or benefice was sometimes converted into a regular fief and was then said to be in *perpetuam commendam.* The practice gave rise to great abuses, and is now almost unknown.

COMMENSALISM, the intimate connection or partnership between animals of quite different affinities; thus commensals, messmates, or fellow-boarders take up their abode together for their mutual benefit. A good example is a large sponge, whose canals and passages shelter innumerable worms, crustacea, etc., which lodge there without expense to their host. Floating jellyfish shelter certain pelagic crustaceans (*Hyperina*) and little fishes. The oyster-crab (*Pinnotheres*) is a typical case of commensalism; it does no harm to the oyster or mussel in whose shell it lives, and which protects it from danger; while, as the result of its sheltered life, its shell is soft and thin. The pearl-oyster, besides taking in a *Pinnotheres* as a boarder, admits a kind of shrimp. Certain small slender, eel-like fishes (*Fierasfer*) insinuate themselves into the body of holothurians, which also keeps open house for *Pinnotheres* and shrimps; hence a holothurian has been compared to a hotel with its *table d'hôte.* Other crustaceans board in different animals; thus a little crab (*Fabia chilensis*) lodges in the end of the intestine of a sea-urchin; another (*Porcellana*) lives on the Brazilian coast in a starfish. Polyps and corals shelter various species of crabs, snails, etc., all being of the same color, while a crinoid (*Comatula*) takes in as a permanent lodger a decapod crustacean (*Galathea*). Hermit crabs, taking up their abode in an empty snail-shell, are obliged to admit a variety of intruders who come to stay. Certain mollusks live in starfishes and other echinoderms and, as the result of their semi-parasitic life, become more or less modified and degenerate. Thus *Stylina* lives on a crinoid (*Comatala*); a species of *Stilifer* becomes encysted on the rays of a starfish (*Linckia*), and on the underside of the arms of the same *Linckia* lives a limpet-like snail (*Thyca*), while *S. astericola* lives in the body of a Bornean starfish, and so on with a number of similar cases. Ascidians throw their «front hall» (*atrium*) wide open to a variety of forms, such as small worms, polyps, mollusks, crustaceans of different orders, sea-spiders, brittle-stars. The «Venus flower-basket,» a silicious sponge of the Philippine Islands, gives shelter to three different kinds of crustaceans: a prawn, a *Pinnotheres* and an isopod.

Rising to the higher animals there occurs on an island off the New Zealand coast the case of the interesting lizard «tuatara,» which shares its deep burrows with a petrel, though the latter may at times be the work of the bird. Each builds its nest on opposite sides of the chamber, the lizard almost invariably choosing the right and the petrel the left side. The former sits with its head close to the entrance ready for any attack; it feeds partly on worms and beetles, and in part on the remains of fishes and crustaceans brought to their common table by the petrel.

By far the most numerous assemblage of messmates are the different kinds of beetles and other insects which live in ants' nests, the number of kinds of which amount to upward of 1,500. See ANT; COCKROACH; SYMBIOSIS.

COMMENSURABLE, among geometricians, an appellation given to such quantities or magnitudes as can be measured by one and the same common measure. Commensurable numbers, whether integers or fractions, are such as can be measured or divided by some other number without any remainder; such are 12 and 18, as being measured by six or three. Magnitudes having no common measure are said to be incommensurable. Thus the diameter and the circumference of a circle are incommensurable as are also the diagonal and side of a square. The word commensurable is also used in a slightly different sense. Numbers like $\sqrt{2}$ which are not commensurable with ordinary rational numbers are said to be incommensurable.

COMMENTARY, a term used (1) in the same sense as memoirs, for a narrative of particular transactions or events, as the 'Commentaries' of Cæsar. (2) A series or collection of comments or annotations. These may either be in the form of detached notes, or may be embodied in a series of remarks written and printed in a connected form.

COMMENTRY, kō-mäṅ-trē, a town in central France, in the department of Allier, eight miles southeast of Montluçon, in the midst of a vast coal field, to which the town owes its prosperity. There are important iron works in the vicinity. Pop. of commune 10,112.

COMMERCE, Tex., city in Hunt County, 90 miles northeast of Dallas, on the Saint Louis Southwestern and the Texas Midland railroads. East Texas Normal College is located here. The city has considerable trade in live stock, cotton and grain, and manufactures flour, cottonseed oil and lumber. It contains also planing mills, railroad repair shops, bottling works and machine shops. The waterworks are the property of the municipality. Pop. 3,000.

COMMERCE, a card game in which each player contributes an equal sum to the pool, and a full pack of cards is dealt to the players. The eldest hand, that is, the one who received the first card on the left of the dealer, then exchanges one of his cards with his left hand player, who, in turn, exchanges one with his left hand player, and so on, until some one finds that his hand consists entirely of cards of one suit, when he calls out "My Ship Sails." Aces count 11, court cards 10, the rest according to "Pips." Each player, through all the exchanges, is aiming to hold a tricon, three cards alike; a sequence, three following each other in the same suit; or a point, the smallest number of pips on three cards. The winner of the pool is the player who has the highest tricon, or, if none is displayed, the highest sequence, or in its place the holder of the best point. Consult Cassell, 'Book of Pastimes.'

COMMERCE, Chambers of. See CHAMBERS OF COMMERCE.

COMMERCE, Department of. One of the main divisions in the executive branch of the government of the United States. We shall here describe its origin and organization and the duties assigned to the office of its secretary. In the year following the adoption of the constitution of the United States three of the executive branches of the government with secretaries were established. First, the Department of Foreign Affairs, by act approved 27 July 1789 (the name of which was changed to Department of State by act approved 15 September of the same year); second, the War Department, created by act of 7 Aug. 1789 (then embracing naval affairs); and third, the Treasury Department, established by act of 2 Sept. 1789. Until the Department of Commerce (and Labor) was organized, in 1903, the Treasury Department was the principal agency of government through which a limited supervision of the commerce and industrial life of the nation was administered, and the designation sought to be given to its chief officer in the Constitutional Convention was that of "secretary of commerce and finance."

Petitions for Its Establishment.— Commercial conventions at Detroit in 1865 and at Boston in 1868 and the National Board of Trade in 1874 memorialized the Congress for the establishment of a Department of Commerce, in order that the rapidly increasing volume of capital invested in commerce and manufactures might be the subject of governmental aid and supervision. Many similar petitions were subsequently presented to Congress, and the subject was referred to in political platforms and annual messages of the President. These petitions, and the representations of commercial organizations before the committees of Congress, stated that the twelfth census showed the aggregate value of the products of the manufacturing establishments of the United States, during the census year ended 1 June 1900, to exceed $13,000,000,000, which was probably almost four times the aggregate value of all the products of agriculture during the same year; that the manufacturing interests in the United States exceeded in volume and importance the industrial interests of any nation in the world, and yet there was no government office specially charged with any duties relating directly to them, and that in this respect the United States was almost alone among the nations of the world.

The Department Established.— In the 57th Congress legislation providing for the organization of a Department of Commerce was enacted. On 4 Dec. 1901 Senator Nelson introduced in the Senate a bill "To establish the Department of Commerce." That bill passed the Senate with a number of amendments, including one changing the name to "Department of Commerce and Labor," on 28 Jan. 1902. (A separate Department of Labor was created 4 March 1913). The act was received in the House 30 Jan. 1902, and nearly a year later (17 Jan. 1903) was passed with amendments. In due course the bill was sent to a committee of conference; the conference report was agreed to in the House on 10 Feb. 1903 and in the Senate the following day; and the bill was signed by the President 14 Feb. 1903.

Organization.— The department, as at present constituted, in addition to the offices and divisions in the immediate office of the Secretary, consists of the bureau of the census, the coast and geodetic survey, the bureau of fisheries, the bureau of foreign and domestic commerce (which has among its duties the direction of the work of commercial attachés at foreign capitals and of commercial agents at home and abroad), the bureau of lighthouses and the lighthouse service, the bureau of navigation, the bureau of standards and the steamboat inspection service.

Duties of the Secretary's Office.— The organic act of 14 Feb. 1903, creating the department, as modified by the act of 4 March 1913, creating the Department of Labor, provides for a Secretary of Commerce whose term of office shall be the same as that of other Cabinet officers. It is the duty of the department, under its organic act, to foster, promote and develop the foreign and domestic commerce, the mining, manufacturing, shipping and fishery industries, and the transportation facilities of the United States; and the Secretary of Commerce is charged with the responsibility of carrying out the purpose of the department as thus broadly outlined. Specifically, however, the powers and duties of the Secretary may be summarized as follows: The administration of the lighthouse service, including the establishment and maintenance of aids to navigation; the taking of the census; the making of coast and geodetic surveys; the collection and publication of statistics of foreign and domestic commerce, and the promotion and development of the foreign and domestic commerce of the United States; the investigation of the cost of production, including field investigation at home and abroad; the inspection of steamboats and the enforcement of laws pertaining thereto for the protection of life and property; the propagation and distribution of useful food fishes and the supervising of Alaskan fur-seal and salmon fisheries; jurisdiction over merchant vessels; the standardization of weights and measures; the formulation (in conjunction with the secretaries of the Treasury and Agriculture) of regulations for the enforcement of the Food and Drugs Act and the Insecticide Act. It is the further duty of the Secretary to make such special investigations and furnish such information to the President or Congress as may be required by them on the foregoing subject matters and to make annual reports to Congress upon the work of his department. The organization includes an assistant secretary, solicitor, chief clerk and superintendent, disbursing clerk, the appointment division, the division of publications and the division of supplies. During the fiscal year which ended 30 June 1915 the organization of the department was changed by the creation of the Federal Trade Commission into which the Bureau of Corporations was merged on 16 March 1915.

COMMERCE, History of.— Commerce is a division of labor among the people of the world. By it man assigns, unconsciously perhaps, the production of certain articles to certain areas in which they can be most conveniently produced, and other articles to other areas or groups of people. Some of these articles may be food, others manufacturing material, the others manufactures, but they are in each case the class most natural to the circumstances surrounding the groups of people who respectively produce them. Manufactures are the natural product of certain areas and peoples, while foodstuffs or manufacturing material are natural to others. The community whose population is greater than is required to cultivate the soil and work the mines and fisheries of the area which it occupies naturally develops a manufacturing industry, and the surplus of its manufactures are gladly exchanged for the food and manufacturing material of other communities. The inhabitants of the less densely populated areas naturally give their attention to the production of those articles of food or manufacturing material which the conditions of their soil and climate most readily supply and gladly exchange their surplus for the manufactures of the more densely populated areas. Thus commerce is the exchange of the products most natural to the conditions surrounding the various peoples and climatic areas of the world, and is thus a division of labor among men. These exchanges of the products of different people and climatic areas have become more general with the cheapening of transportation and enlargement of the facilities for distribution of natural as well as manufactured products. The exchange of the products of the respective areas and groups of people has become a convenient division of labor, the principle which underlies all successful business and industrial activities of civilization.

The history of commerce divides itself into three great periods. The first is that in which merchandise was transported by men and animals on land and in vessels sailing along the coasts and seldom venturing out of sight of land; the second began when man learned the use of the compass and traversed the great ocean, but by sailing vessels only. The third began when he applied steam power to the movement of vessels on the ocean and vehicles on land, and this period was simultaneous with that of the establishment of instantaneous communication by the use of electricity.

These three periods vary greatly in length. The first period, that of the sailing vessel creeping along the shores or crossing narrow seas by the observation of the heavens, extends from the earliest period of history down to about the year 1300. The second, that of the sailing vessel guided by the compass, extends from about 1300 to 1819, when the first steam vessel crossed the ocean. The third, that of the steam vessel on the ocean, steam transportation on land and instantaneous intercommunication by electricity are all included within the last 100 years. These three periods, of course, greatly overlap one another. The period of the sailing vessel, guided by the observation of the shores or the sun and stars, merged almost insensibly into that in which vessels were guided by the use of the compass, and no exact date can be named as that of the transfer. The compass was known as early as the year 1300, but it took more than a century to so develop its practical use as to lead man to the exploration of the great oceans which he had always looked upon as a barrier to travel or exploration; nor can it be said that the transition from the sailing to the steam vessel occurred at a fixed date, for it took 20 years after the first steam vessel crossed the ocean to establish even a limited trans-Atlantic service, and for many years thereafter a large part of the commerce was carried by sailing vessels. The construction of railways, a part of the third period, occupied many years of time and experimental work. The telegraph and ocean cable, the telephone and wireless telegraphy, which are important factors in the third period, were a gradual development but multiplied enormously the commerce demanding the services of the steamship and railways.

In the first period commerce centred in the Mediterranean and extended over western Europe, northern Africa and western Asia. In the second period, when the use of the compass encouraged man to explore the oceans, the Atlantic was crossed in 1492, India reached in 1496, China in 1516, and the first voyage around the world made in the period 1519–22. Yet with these long experiences of the sailing vessel, 3,000 years of the first period and 500 years of the second, the entire international trade of the world when the period of steam began 100 years ago was but $1,500,000,000, and to-day is $45,000,000,000. Thirty-five hundred years of the sailing vessel on the oceans and animal transportation on land had developed but $1,500,000,000 of international trade, then, with the advent of steam and electricity 100 years brought the total to $45,000,000,000, or 30 times as much in 100 years as had been developed in 3,500 years without steam and electricity.

The exchanges between nations and peoples have always been governed by certain great natural laws. Tropical products have always been wanted by temperate zone men and temperate zone products are wanted by the people of the tropics. Also, the people of the older and more densely populated areas demand the food and other natural products of the more recently developed regions and the newly developed areas demand the manufactures and luxuries of the older communities. Densely populated Europe buys the foodstuffs and manufacturing materials of the more newly developed continents, North America, South America, Asia and Oceania, and these newly developed areas take the manufactures of Europe in exchange for their natural products. This is the division of labor among the world population, accomplished by commerce.

The earliest records of commerce between great groups of people relate to the exchanges between Egypt and Mesopotamia 4,000 years ago. The Egyptians were chiefly an agricultural people, while those of the Mesopotamia Valley, although agricultural, had developed certain manufacturing industries, and drew other manufactures from India, and perhaps China, and also certain temperate zone products from the upper waters of the Tigris and Euphrates. So, there grew up limited trading between the two valleys, carried across the desert by the caravans of the Arabs, chiefly the silks, precious stones, spices and gems of the Orient, exchanged for the cotton and flax and cattle and food grains of Egypt. The Phœnicians, a Semitic race closely allied to the Hebrews, removed about this time from the Persian Gulf to the eastern end of the Mediterranean, and slowly built up a carrying trade along its shores, their vessels first propelled by oars, but later by sails. Gradually, they extended their operations along the shores of the Mediterranean, passing through the Bosporus into the Black Sea, and also pushing westward along the northern shore of Africa, and even in a limited way along the western coast of Europe as far north as the British Isles and the Baltic. They built great cities, Tyre, Sidon and Carthage, established manufacturing industries and became the great traders of the world during a very long period, bringing the temperate zone products of the Baltic Sea region and of northeastern Europe, wool, furs, grain, tin and copper and silver, and exchanging them for the semi-tropical products of the Mediterranean countries and Euphrates Valley and the manufactures of their own great cities. Of course it took hundreds of years to develop these cities and their manufacuring industries and build up the commerce with the great frontage stretching from the Baltic Sea along both sides of the Mediterranean and the western coast of Europe, and the Phœnicians were the great trading people of the world for more than 1,000 years.

Gradually, however, the Greeks, who from their homes nearby witnessed the successes of the Phœnicians, followed in their footsteps, Athens and Corinth became manufacturing and commercial cities, and Greek vessels and merchants entered upon the trade of the same area in which the Phœnicians had been so successful. The conquests of Alexander, which extended to Persia and India, also aided Greek commerce by the views which they disclosed of Oriental civilization and the increased use of money in commerce, just as the experiences of the Crusaders in the same area did for Western Europe many generations later. The Greeks, however, did not develop as successful commercial qualities as did the Phœnicians, and the period of their control of world commerce was much shorter. The Romans succeeded the Greeks, as they extended their political control over an area nearly as great as the present United States, and with a population nearly as big as our own at the present time, stretching from the Euphrates valley on the east to northern Europe, and including both frontages of the Mediterranean. They built up great fleets of commercial vessels, developed roads and commercial routes throughout their colonies, and Rome became the great centre of their enormous area. The natural products of northern and western Europe and the manufactures and luxuries of the Orient supplied the demands of that great and luxurious city of more than 1,000,000 inhabitants. The decline of the Roman power reduced this commerce very greatly, though that with the East was somewhat revived by the transfer by Constantine of the seat of government to Byzantium, since called Constantinople.

The development of the Mohammedan Empire in the 7th century A.D. made great changes in the commercial world. The Mohammedan religion favored commerce, and as its followers occupied most of the Mediterranean shore the effect upon commerce and industries was very great. Damascus, Bagdad, Alexandria, Cairo and the cities of Spain became great centres of industry and trade, and the people of the Christian world learned from the Mohammedans many important lessons of industry and traffic. Even the Crusades, which were organized military movements against the Mohammedans in the Holy Land, taught the people of western Europe many valuable lessons in manufacturing through the opportunities thus offered to the Europeans of observing the superior industries of the Mohammedan world, in manner similar to that resulting from Alexander's invasions of the Orient, and these lessons resulted in the development of manufacturing industries in western Europe.

During the long period extending from the fall of the Western Roman Empire to the application of the compass to ocean navigation, the period which is usually designated as the Middle Ages, new trade routes and commercial centres were developed. Venice and other Italian cities became great trading and manufacturing centres, sending their ships to the eastern end of the Mediterranean and the Baltic Sea for the Oriental products of tropical Asia and the grains and wool of the Baltic Sea frontage, redistributing them with their own manufactures to northern and western Europe by land routes and coasting vessels and bringing back the woolens and linens and leather and other products of France and Great Britain and Germany and the Low Countries. Again it was the exchange of the products of different climatic areas and different civilizations. Venice became a great manufacturing, commercial and financial centre and sent its manufactures to Asia Minor, northern Africa and northern and western Europe. Its vessels were numbered by thousands, yet their operations were confined to the inland seas and the Atlantic Coast. It sent its consuls to report upon conditions of the countries with which it traded, built up a great banking and credit system with branch banks in these countries, and its example was followed by other Italian cities, especially Genoa and Florence. These commercial activities of the Italian cities developed trading stations and cities in northern Europe. Antwerp, Amsterdam, London, Cologne, Hamburg and Lubeck became active commercial centres, while fairs and markets were built up along the routes over which this merchandise was carried, developing into trading towns and cities.

Commerce during this period of the Middle Ages was, however, subject to constant attack by brigands and petty feudal lords, and as a result the great trading cities and stations of northern Europe built up organized leagues for the protection of their trade. They supplied armed guards to protect the commerce moving along the land routes, and this facilitated the establishment of new trading stations which developed into towns and cities. The Hanseatic and Rhenish leagues, organized in Germany, included nearly 100 towns in each, and their influence in the protection to and development of trade was very great and was an important influence in developing orderly government and new political governments. Their activities extended over a term of nearly 250 years, and only ended when the use of the compass turned the activities of trade to the oceans, greatly reducing the importance of the Italian cities and the trade systems which they had built up. The commercial and financial activities of this long period, however, developed great commercial, financial, banking and credit systems, as well as organized governments, and fitted western Europe to begin trade with the Americas and eastern Asia when the application of the compass to ocean navigation revolutionized trade routes and commercial methods.

The period of the practical application of the compass to ocean navigation began about 1400, although its use was begun in a limited way about the year 1300. The eastern frontages of the Atlantic were explored and the islands off the coast of Africa occupied. Columbus, convinced that the earth was a globe, and that India could be reached by sailing westward, ventured boldly out on the Atlantic, discovering America in 1492. The circumnavigation of Africa and the opening of the route to India occurred in 1496, the extension of the route to China in 1516 and the circumnavigation of the globe 1519–22. This developed new routes of commerce and also the true functions of commerce, the interchange of the products of different climatic areas and different types of civilization, the division of labor among the people of the world. The great masses of Oriental population were found possessed of certain products desired by those of Europe who were able to offer in exchange their own manufactures and the precious metals which they had begun to receive from America. Commerce then became truly international and intercontinental, exchanges between different climatic areas and civilizations. To develop this new form of commerce, the interchange of the products of the various quarters of the entire globe, new facilities were required, and large sums of money demanded, both in the transportation of merchandise and in the financial operations of the exchange. The governments of Europe, stimulated by the prospects of gaining additional territory as well as commercial profits, entered the field. The Spanish, Portuguese, Danish, English and French governments chartered commercial companies for the development of trade and exploration and granted them liberal aid, and at the same time encouraged colonization, especially in America, where there were vast unoccupied areas. The Portuguese sent their trading ships around Africa and established a trading station at Goa, on the coast of India, and the commerce was conducted under the direction of the government, but open to all Portuguese. Spain explored and conquered Mexico and the western coast of South America, and established commerce with those areas, with squadrons escorted by ships of war. Merchandise was sold to the natives and colonists, and large quantities of gold and silver transferred to Europe, stimulating manufactures and proving extremely useful in the trade with the Orient. The English, who had been buying quantities of Oriental merchandise from the Portuguese, were excluded from that market by the Spanish government, and so established the great East India Company in the year 1600. It developed important trading relations with the Indies and later with China, and with the co-operation of the government extended its control over parts of India, laying the foundations for the occupation of that country by the British. The Dutch also excluded from their large trade with the Portuguese, established the Dutch East India Company in 1602 and sent their ships to the Orient, taking possession of Java and developing a very large business in Oriental products, especially spices which were extremely popular in Europe at that time. Their business was highly successful and Holland became a great commercial, financial and banking country. The French government also established an East India trading company, also one for the West Indies, but they were less successful than those of Great Britain and Holland.

These great commercial companies, chartered by their respective governments, were not only traders but explorers and colonizers as well, especially those operating in America, while those operating in the Orient established trading stations and by obtaining concessions from the native governments gained control of important areas. The colonies and trading stations thus established contributed greatly to the advantage of the mother country, both by their contributions of needed supplies and by the market they furnished for manufactures. As a result of the desire to develop the production of the tropical areas, especially in America, the African slave trade was built up, multiplying the production of the colonies, in the New World, and only terminating with the American Civil War. The application of the compass to navigation had a profound effect upon world commerce. Prior to that time most of the international trade was the exchange of the products of the near East and the subtropical Mediterranean area for those of northern and western Europe, a limited exchange of the products of the different climatic products and civilizations. But with the extension of the transportation and trade to every part of the world, and the development of the producing power of the new countries the exchanges between different civilizations, climatic areas and manufacturing communities was greatly enlarged, and commerce became more than ever a division of labor among great groups of people and great sections of the world.

The transition from the sail on the ocean and animal power on land to steam vessels on the ocean and the railway on land was not accomplished in a single year or decade. The first steam vessel crossed the ocean in 1819, and another from England to India in 1825, but it was not until 1838 that successful trans-Atlantic steam service was established.

All of these vessels were propelled by the paddle wheel, which proved unsatisfactory for ocean service, and in about 1845 the screw propeller was introduced and soon displaced the paddle wheel. Iron began to be substituted for wood for the construction of vessels about 1850, and steel for iron about 1865. The engines used by the vessels were at first very simple and unsatisfactory, and it was not until 1864 that the compound engine was adapted to marine use, and the triple-expansion engine in 1874, and other equally important changes later. By these improvements the speed and carrying power of vessels was quadrupled. A single steamship of to-day will carry 600 modern carloads of ordinary merchandise. The result of this development of the steamship is that the tonnage of the sailing vessels of the world is now but about one-fourth that of 1860, while that of the steamships is 16 times as great as in that year, and when we remember that the average steamship will, by reason of its greater speed and more complete control in all kinds of weather, make four times as many trips over a given course in a year as the sailing vessel we begin to realize the enormous expansion of the carrying power which came with the ocean steamer. The growth of the railway on land was an equally important factor in the development of the third period, and so was that of the telegraph. The railways of the world were but 24,000 miles in 1850, now they are 725,000 miles, or 30 times as much, and their carrying capacity per mile is probably four times as much as then, due to the improvement of roadbeds, the change from iron to heavy steel rails, double and quadruple tracks, stronger, larger and faster engines and larger and better cars. They have made possible the transportation of merchandise from the interior of the continents to the water's edge, and this fact has stimulated the development of population in the interior. The population of the interior of the United States, for instance, has trebled since 1870, and the value of its products increased from $2,000,000,000 to $20,000,000,000. World population, which was but 650,000,000 in 1818, grew to 1,690,000,000 in 1918, due in part to the opening of new areas to population, and in part to the practicability of increasing the density of population at any point and transporting from other parts of the world the food which is required.

Instantaneous communication has also contributed greatly to the growth of commerce in the latest period. The land and ocean telegraphs in 1850 aggregated but 5,000 miles and to-day are more than 2,000,000 miles, with greatly increased facility of transmission per mile, and even this wonderful system has been greatly intensified by the telephone and wireless telegraph. The fact that the business man or producer in any part of the world can now speak instantly to the business man in any other part of the world, on the other side of the globe, in the interior of the continent and even to the vessels in the midst of the oceans, and may also transmit funds by the same instantaneous process, if desired, adds enormously to the convenience and activity of commerce.

Finance has also participated largely in this growth of commerce in recent years. The world's production of gold prior to 1850 was less than $10,000,000 a year; now it is $460,000,000 per year, or 50 times as much. The quantity of gold mined in the short period since 1870 is twice as much as in the 400 years prior to 1870. This enormous increase in the quantity of the world's accepted medium of exchange has greatly aided the growth of commerce, while the development of the banking and credit systems has been quite as important. The banking power of the world, by which we of course

WORLD'S DEVELOPMENT OF POPULATION, PRODUCTION, VESSEL TONNAGE AND COMMERCE: 1800 TO 1916

YEAR	Population [1]	Commerce		Nominal tonnage of vessels of over 100 tons		Railways	Telegraphs	Cables	Gold production, decade ending year named
		Total	Per capita	Sail	Steam				
	Millions	*Million dollars*	*Dollars*	*Thousand tons* [2]	*Thousand tons* [2]	*Thousand miles* [2]	*Thousand miles*	*Thousand miles*	*Million dollars* [3]
1800	[4] 640	1,479	2.31	4,026	....	....	....	....	128.5
1820	[5] 780	1,659	2.13	5,814	20	....	....	....	76.1
1830	[5] 847	1,981	2.34	7,100	111	0.2	....	....	94.5
1840	[6] 950	2,789	2.93	9,012	368	5.4	....	....	134.8
1850	[6] 1,075	4,049	3.76	11,470	864	24.0	5	⅒	363.9
1860	[6] 1,205	7,246	6.01	14,890	1,710	67.4	100	1⅓	1,334.0
1870	[7] 1,310	10,663	8.14	12,900	3,040	139.9	281	15	1,263.0
1880	[8] 1,439	14,761	10.26	14,400	5,880	224.9	440	49	1,150.8
1890	[9] 1,488	17,519	11.80	9,166	8,295	390.0	768	132	1,060.1
1900	1,543	20,105	13.02	6,674	13,857	500.0	1,180	200	2,100.0
1906	1,579	27,418	17.36	5,809	19,713	564.0	1,200	[10] 270	3,099.8
1910	1,616	33,634	20.81	4,624	22,046	637.0	1,307	291	3,780.7
1911	1,630	35,909	21.71	4,366	23,932	666.0	1,356	[11] 318	3,981.7
1912	1,643	39,570	24.08	4,083	24,978	683.4	1,400	[11] 320	4,151.1
1913	1,652	40,420	24.47	3,891	26,517	690.2	1,462	[11] 330	4,283.4
1914	1,661	37,760	22.73	3,686	27,988	703.5	1,489	[11] 335	4,375.1
1915	1,672	31,302	18.72	3,583	28,160	717.5	1,526	335	4,465.3
1916	1,682	46,523	27.50	3,435	27,858	720.5	....	....	....

[1] Figures for later years include certain unimportant areas for which information was not available in earlier years.

[2] Mulhall's estimates except for 1830, 1890, 1900, 1906 and later years.

[3] Soetbeer's estimates prior to 1860.

[4] Malte-Brun's estimate for 1804.

[5] Based on Balbi's estimate for 1828.

[6] Based on Michelet's estimate for 1845.

[7] Based on Behm-Wagner estimate for 1874.

[8] Levasseur's estimate for 1878.

[9] Royal Geographic Society's estimate.

[10] Figures of the Bern International Institute.

[11] Estimate of the imperial post-office of Germany.

PRODUCTION OF GOLD AND SILVER IN THE WORLD SINCE THE DISCOVERY OF AMERICA

Period	Gold[3]		Silver	
	Total for period		Total for period	
	Ounces, fine	Value	Ounces, fine	Coining value
1492	424,773,668	$8,780,192,000	7,999,084,548	$10,343,518,867
1896	9,783,914	202,251,600	157,061,370	203,069,200
1897	11,420,068	236,073,700	160,421,082	207,413,000
1898	13,877,806	286,879,700	169,055,253	218,576,800
1899	14,837,775	306,724,100	168,337,453	217,648,200
1900	12,315,135	254,576,300	173,591,364	224,441,200
1901	12,625,527	260,992,900	173,011,283	223,691,300
1902	14,354,680	296,737,600	162,763,483	210,441,900
1903	15,852,620	327,702,200	167,689,322	216,810,300
1904	16,804,372	347,377,200	164,195,266	212,292,900
1905	18,396,451	380,288,700	172,317,688	222,794,500
1906	19,471,080	402,503,000	165,054,497	213,403,800
1907	19,977,260	412,966,600	184,206,984	238,166,600
1908	21,422,244	442,836,900	203,131,404	262,634,500
1909	21,965,111	454,059,100	212,149,023	274,293,700
1910	22,022,180	455,239,100	221,715,673	286,662,700
1911	22,348,313	461,939,700	226,192,923	292,451,500
1912	22,549,335	466,136,100	224,310,654	290,017,800
1913	22,249,596	459,939,900	223,907,843	289,497,000
1914	21,240,416	439,078,260	160,626,019	207,678,038
1915	22,674,500	468,725,000	178,850,000	231,241,000
1916	22,108,000	457,006,000	156,627,000	192,813,000
1917[1]	20,723,000	428,381,000	161,445,000	208,736,900
Total[2] 1492–1917[2]	823,743,071	17,028,281,023	11,986,745,132	15,497,987,905

mean capital, surplus, deposits and circulation, has grown from approximately $8,000,000,000 in 1870 to $80,000,000,000 at the present time, and credits have expanded with an equal rapidity.

It is for these reasons that the third period of world commerce, that of steam, electricity and finance, has been one of unparalleled developments. In the first period, extending over thousands of years of the sailing vessel without the compass, in which the oceans were considered a barrier to commerce or exploration, the world trade in an entire year was less than that of a single day at the present time. In the second period, that of the sailing vessel and compass, covering about 500 years, in which man traversed the globe by sailing vessels only, he built up world commerce to $1,500,000,000 a year. In the third period, which has covered but 100 years, he has developed a trade of $45,000,000,000 per annum, or 30 times as great as he had been able to create in 3,500 years without the aid of steam, electricity and modern finance. International commerce at the beginning of the third period averaged about $2 per capita for the entire world population; in 1913 it was about $24 per capita for the greatly increased population. In this last period of growth the same principles of a division of labor among the people of the earth, the exchange of the products of certain peoples and areas and climates for the different products of other areas and peoples and climates stand out more clearly than in the earlier periods. Manufacturing Europe buys food and manufacturing materials from the other continents and pays for them in manufactures; the United States draws upon the tropics and Orient for manufacturing material and certain foodstuffs and pays for them with the product of her factories; Asia exports her silk and tea and fibres to Europe and the United States and takes manufactures in exchange; South America and Oceania sell their foodstuffs and raw material to the United States and Europe and take the product of their factories; and Africa sells gold and diamonds and ostrich feathers and high grade cotton and buys manufactures from Europe and America. Everywhere it is the exchange of the products natural to the area in which they are produced for the natural products of some other area and people, and thus the division of labor becomes more and more sharply defined with the enlargement of transportation, intercommunication and finance.

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[1] For 1917 figures of the previous year are repeated for those countries from which no returns were received.

[2] The figures are those of the Director of the Mint, but do not represent the footings of the respective columns, as that official, for the period from 1871 to 1885, employs Soetbeer's averages upon a somewhat different basis from that used in this table.

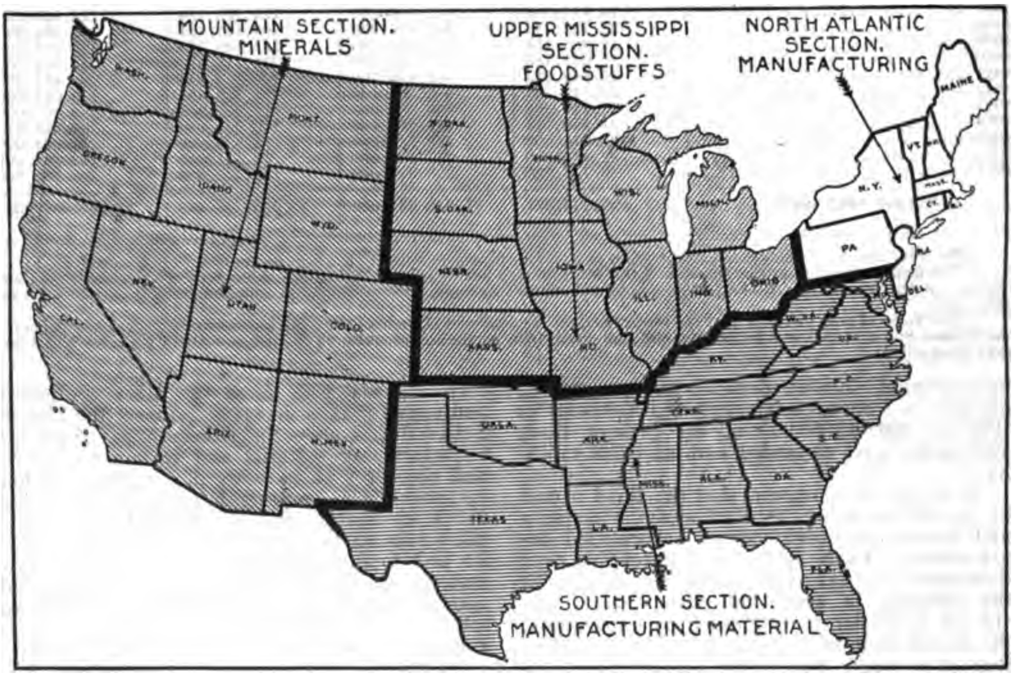
[3] The value of gold production of the world from the discovery of America (1492) to the celebrated silver campaign in the United States (1896) was $8,780,000,000, and from 1896 to the end of 1918, $8,680,000,000 (1918 estimate based on 1917 production).

the Netherlands, and the annual 'Statistical Abstract of Foreign Countries' issued by the British Board of Trade.

OSCAR P. AUSTIN,
Statistician, National City Bank of New York.

COMMERCE, Internal, of the United States. The internal commerce of a country is the exchange of merchandise among its own people. Studies of the internal commerce of a country are valuable, especially from the economic standpoint, in determining the industrial and commercial activity of the people, at stated intervals and also in comparison with that of other groups of people.

To fully determine the internal commerce of a country would require a knowledge (1) of the original value of the merchandise exchanged; (2) the number of times that each article was bought and sold between the original producer and consumer; (3) the cost added by transportation from the producer to the consumer; and (4) the cost added by the expenses and profits of the dealers or «middlemen» who handled and rehandled it in its passage from producer to consumer.



Obviously it is impossible to determine with accuracy the costs added by these processes through which the product passes on its way from production to consumption. In some cases they involve short and in other cases long distance transportation; in some cases a small number of transfers from hand to hand, and in other cases many; in some cases the cost of the product is greatly increased by the processes required to fit it for consumption, and in certain articles the charges added for «expenses and profits» form a much higher percentage of the original value than in others. Fruits from the Pacific coast cross the continent and after numerous handlings by dealers are consumed in the Atlantic coast cities and towns. Manufactures produced on the Eastern frontage from material produced in the extreme south or on the other side of the globe pass through the hands of jobbers and retailers and are consumed by those on the Pacific coast who grew the fruit sent to the Atlantic frontage, and this is true in a less extreme form of the various products interchanged. By one process, however, it is possible to get a fairly accurate index of the commercial activities of a country. If we can determine at stated intervals the value at the place of production of all articles forming the exchanges among the people we can at least approximate the growth from decade to decade of the activities of exchange among the people of the country and the increase or decrease per capita, and can also compare the same with those of other countries, and even determine the relation which our own internal trade bears to our foreign trade, or to the total international commerce of the world.

The principal articles forming the internal commerce of a country are (a) products of agriculture; (b) products of the mines; (c) products of forests and fisheries; (d) manufactures produced within the country; and (e) articles imported and sold among the people. All these are measured in a single unit of measurement, the dollar, at the place of production. While the manufactures are of course made from the products of the other industries, agriculture, mining and forestry and from certain foreign products, and their use as a basis thus involves a second sale of a part of the already recorded product, the fact that the manufactured article presents this material in an entirely new form seems to justify the inclusion of all manufactures among the five great groups of articles forming the internal commerce of a country, agricultural products, VALUE AT THE PLACE OF PRODUCTION OF ARTICLES FORMING THE INTERNAL COMMERCE OF THE UNITED STATES, 1850 TO 1914

Census year	Manufactures	Farm products	Minerals	Forests, fisheries, etc.	Imports	Total materials of internal commerce	Population	Per capita internal commerce
	Million dollars	Million dollars‡	Million dollars	Million dollars§	Million dollars	Million dollars	Millions	Dollars
1850	1,019	1,003	97	150	311	2,580	23	112
1860	1,896	1,300	157	200	408	3,961	31	128
1870*	3,385	1,458	220	250	624	5,973	39	153
1880	5,370	2,013	401	300	855	8,939	50	179
1890	9,373	2,160	616	500	1,022	13,661	63	217
1900	13,107	4,017	1,107	600	1,083	19,914	76	262
1910	†22,100	7,498	1,991	800	1,892	34,281	92	372
1915	†26,300	8,895	2,393	1,000	2,185	40,000	100	400

* Manufactures and agricultural products reduced to gold basis. † Includes estimate for hand trades and neighborhood industries. ‡ Exclusive of estimated consumption on farms. § Estimated.

minerals, forest and fishery products, manufactures, and imported merchandise.

The acceptance of these five great groups as the articles forming the internal exchanges of a country enables us to measure the internal commerce of the United States at various dates and its average value per capita of the entire population, and also to determine how our own internal trade compares with that of other countries when estimated on the per capita basis. To measure the value of the merchandise forming the internal commerce of the countries we must also utilize the official or other acceptable valuations of these five great groups of articles. The census of 1915 put the value of the factory products of the United States in 1914 at $24,246,000,000, and we know from the reports of earlier censuses, that the value of the manufactures produced by the “hand trades and neighborhood industries” is nearly $2,000,000,000 which must be added to the value of the factory products in an effort to obtain the true value of all manufactures produced in the country. So we may set down the value of the manufactures turned out in the United States in 1914 at fully $26,000,000,000. The Secretary of Agriculture estimates the value of the farm products of the United States in 1914 at approximately $10,000,000,000, though it is estimated that about one-tenth of this, or say $1,000,000,000, was consumed on the farm and did not therefore enter internal trade, leaving the amount of agricultural products entering internal commerce at approximately $9,000,000,000. The Geological Survey of the United States estimates the value of the mineral products of the country in 1914 at over $2,000,000,000, and to this we must add at least $1,000,000,000 for the products of the forests and fisheries and others of a miscellaneous character. The merchandise imported in 1914, all of which entered internal commerce after passing through the customs houses, was valued at nearly $2,000,000,000 on its arrival at the ports, and of course the tariff duties were added to this cost before it entered trade.

These great groups of merchandise, the manufactures, the agricultural products, the minerals, the products of the forests and fisheries and the merchandise imported, form the internal commerce of the United States, the merchandise exchange between its people, for even that which is finally exported is a part of the internal commerce before exportation. The value of the manufactures in 1914 was $26,000,000,000; agricultural products exclusive of those consumed on the farm, $9,000,000,000; minerals, $2,000,000,000; miscellaneous products, $1,000,000,000; imports, $2,000,000,000, making an aggregate of $40,000,000,000 as the value at the place of production of all the articles exchanged among our own people, and forming the internal commerce of the country in the year 1914.

This grand total of $40,000,000,000, the estimated value of the merchandise forming the internal commerce of the country, represents the products in question at the place of production, and does not make any allowance for the cost added by transportation or the profits of various dealers who handle it between the producer and consumer. Nor does this total of $40,000,000,000 represent more than one sale of the merchandise in question, the original sale by which it passed from the hands of the producer to the markets of the country. How many times it is handled and resold before it reaches the consumer and how much advance he pays upon the price received by the producer is a matter of conjecture rather than of possible statistical measurement. There are no accepted standards, governmental or otherwise, by which we may determine the average number of times that the merchandise is handled or the percentage added to the price at which it is sold by the producer.

With this basis of measurement of the value at the place of production of the merchandise forming the internal commerce of the United States, it is possible to measure the growth of the merchandise exchanged among her own people from year to year or decade to decade, though the fact that this must be expressed in a single unit of measurement, the dollar, reduces the value of the comparisons since general advances or reductions in prices would show greater fluctuations in the value figures than those in quantities. For purpose of general comparison in measuring the growth of the grand total of all products forming the internal commerce of the country, it is, however, necessary to utilize the single standard applicable to all, the dollar. Accepting the above discussed standards of measurement of the internal commerce of the country, a single measurement at the place of production of all articles forming the internal commerce of the country, we find that the internal commerce of the United States grew from $2,500,000,000 in 1850 to $4,000,000,000 in 1860; $6,000,000,000 in 1870; $9,000,000,000 in 1880; $14,000,000,000 in 1890; $21,000,000,000 in 1900; $34,000,000,000 in 1910 and $40,000,000,000 in 1914, a per capita average of $112 in 1850, $128 in 1860, $153 in 1870, $179 in 1880, $222 in 1890, $276 in 1900, $371 in 1910 and $400 in 1914, all of these figures being in very round numbers.

It is interesting at this point in the study of the internal commerce of the United States to compare it with that of other countries. This comparison can be only in very general terms, because of the fact that no other country has as complete facilities for such study as has the United States, since no complete and periodical census of manufactures is taken in the European countries. Utilizing, however, the partial censuses which have been made from time to time and supplementing these with estimates of the statisticians and economists of the respective countries, the comparison of the value of merchandise forming the internal commerce of the United States, Great Britain, Germany and France in 1913 is shown by the following table. The estimates for the European countries are upon a basis similar to that used in the above discussion of the United States, namely, products of agriculture, mining, fisheries, forests, manufacture and imported merchandise. It will be seen that the per capita of the internal commerce of the United States is much larger than that of the other countries enumerated.

ESTIMATED VALUE OF MERCHANDISE FORMING THE INTERNAL COMMERCE OF GERMANY, FRANCE, UNITED KINGDOM AND THE UNITED STATES, 1913:

	Material forming internal commerce	Population	Per capita
Germany..........	$15,000,000,000	68,000,000	$221
France............	10,500,000,000	40,000,000	262
United Kingdom....	12,500,000,000	46,000,000	272
United States (1914)	40,000,000,000	100,000,000	400

The causes of the greater interchange of merchandise among the people of the United States than in other countries lies in part in the large area and great diversity of production in the United States. With an area practically equal to that of Europe great mountain regions and long sea frontages the United States has varying climatic conditions from temperate to sub-tropical, and consequently a greater variety of products than the smaller countries of Europe with which comparison is made in one of the above tables. It is in this fact, that our own country by its very bigness and diversity of climate produces such a great variety of products, and has exceptional facilities for their interchange, that we have applied in the United States more fully than elsewhere the great economic law of a division of labor among men and thus made our interchanges greater in proportion to population than is natural to other and smaller countries.

It is, however, when we compare the value of the merchandise forming the internal commerce of the United States with that forming the international commerce of the world that we begin to fully realize the great volume of our own internal trade. International commerce, as it is usually stated, consists of an aggregation of the imports and exports of all countries of the world, but as every article exported is again counted when it becomes an import at destination, it is apparent that this customary aggregation of all the exports and imports of all countries of the world really counts the merchandise twice; first, when exported from the country of production, and again, when imported into the country of consumption, and that, therefore, the real value of the merchandise forming international trade of the world is but about one-half that of the customary statement of international trade. For example, the international trade of the world in 1913, the year preceding the European War, which may be accepted as a normal year of international trade, aggregated $40,000,000,000. But as this aggregation included all exports plus all imports, it is apparent that the real value of the merchandise, counted when exported and again counted when imported, is in fact but $20,000,000,000, or one-half of the usual statement of international trade in 1913, $40,000,000,000.

The table which follows shows the aggregate value of exports and imports of all countries of the world, the value of the merchandise forming the international trade, and the value of the merchandise forming the internal commerce of the United States, from 1850 to 1914.

COMPARISON OF INTERNAL COMMERCE OF THE UNITED STATES WITH INTERNATIONAL TRADE OF THE WORLD, 1850–1914.

	Aggregate value of imports and exports of all countries	Value of merchandise forming international trade of world	Value of merchandise forming internal commerce of United States
1850	$4,050,000,000	$2,025,000,000	$2,580,000,000
1860	7,246,000,000	3,623,000,000	3,961,000,000
1870	10,664,000,000	5,332,000,000	5,973,000,000
1880	14,760,000,000	7,380,000,000	8,939,000,000
1890	17,520,000,000	8,760,000,000	13,661,000,000
1900	20,106,000,000	10,053,000,000	19,914,000,000
1910	33,634,000,000	16,817,000,000	34,281,000,000
1914	*40,420,000,000	*20,210,000,000	40,000,000,000

* 1913

The fact that the internal commerce of the United States grew more rapidly than the international commerce of the world is accounted for in part by the fact that our population increased practically 100 per cent in the period in question, while that of the world as a whole increased but 15 per cent in the same time.

There are no gateways through which the internal commerce of a country must pass and therefore no governmental or other machinery by which it may be measured in detail. We know that Congress passes laws for the regulation and control of the «commerce between the States» and that we have an «Interstate Commerce Commission» yet there is no record, financial or otherwise, of the value of the merchandise passing between the respective States or other divisions of the country, and billions of dollars worth of merchandise cross and recross State and municipal boundary lines without a record of any sort as to their character, value, the place of production or final destination.

By one process, however, it is possible to estimate the value of the merchandise forming the internal commerce of the United States.

Necessarily, the merchandise exchanged among our own people consists chiefly of the products of our own industries, and while it is not possible to measure the actual movement of merchandise between the States, it is practicable to obtain a general view of the interchanges between the great sections of the country. Nature and man in conjunction have divided the United States into four pretty distinct sections. These four great sections are (1) the North Atlantic area usually designated as the New England and Middle States; (2) the upper Mississippi Valley; (3) the South; (4) the mountain regions of the West. These four sections differ radically in their products and as a result, the interchanges between them are very large and form a large part of the internal commerce of the country. They are in fact an application of that great economic law of division and labor among great groups of people and the interchanges of their respective products. It is the operation of this great economic law of a division of labor among the people of the world which has developed the international trade of the globe and it has become equally effective in producing the great interchanges of merchandise between certain sections of our country which we designate as our internal commerce.

In the North Atlantic area which occupies all of the New England and Middle States, there is a long ocean frontage, rivers furnishing power for manufacturing purposes, a comparatively light soil in most of the area, a dense population, great industrial and trade centres, plentiful supplies of fuel and plentiful transportation facilities. These conditions have made it the great manufacturing section of the United States. The second mentioned area, the upper Mississippi Valley stretching from the eastern boundary of Ohio to the western edge of Kansas, Nebraska and the Dakotas, is the great temperate zone producing area of the United States with a rich deep soil, producing most of the wheat and corn and meats of the country, and while it has a population slightly larger than the North Atlantic section, the density of population is much less since its area is four times as great. The third section, the South, including everything south of the Potomac and Ohio rivers as far west as the western boundaries of Oklahoma and Texas, has in a part of the area a sub-tropical climate and its most important products are cotton, rice, tobacco, cane sugar, and other subtropical growths, timber, live stock, petroleum and limited quantities of cereals. The fourth section, the mountainous area stretching from the western borders of Texas, Nebraska, Kansas and the Dakotas to the waters of the Pacific has a larger area and smaller population than any of the other sections mentioned and produces materials of a radically different character, minerals, precious metals, wool, lumber, beet sugar and fruits. To put it in a single sentence, the North Atlantic area produces the bulk of the manufactures of the country; the upper Mississippi area produces most of the foodstuffs; the South produces manufacturing material and tropical foodstuffs; the West minerals, wool, sugar and fruits; and these four great areas freely interchange their products, thus forming a large part of the internal commerce of the country.

The North Atlantic Section which is composed of the New England and Middle States, has a comparatively small area, only about as much as that of the State of California, yet its population is 30 per cent of the entire country, the area being 160,000 square miles, and its population 30,000,000. It produced in 1914, the last census year, over $11,000,000,000 worth of factory-made manufactures out of a total of less than $24,000,000,000, or practically one-half of the factory products of the entire United States when measured by values. The capital invested in its manufacturing industries was $11,000,000,000 out of a total of $23,000,000,000 invested in the entire manufacturing industries of the United States.

Yet this North Atlantic area with 30 per cent of the population and one-half of the manufactures of the country produces but a small proportion of the food or manufacturing material which its people and industries require. With 30 per cent of the population of the country, it produced but 5 per cent of the wheat, 3 per cent of the corn, 9 per cent of the cattle, 4 per cent of the swine, 4 per cent of the sheep, none of the sugar and but 9 per cent of the value of all foodstuffs produced in the country. Clearly, it is dependent upon other sections of the country for most of the food and manufacturing material required, for its 30,000,000 people engaged chiefly in manufacturing. For manufacturing material this great manufacturing area is also dependent upon other sections of the country. It produces no cotton although manufacturing 60 per cent of the cotton goods of the country, little wool, although turning out 90 per cent of the woolen manufactures of the United States, has but 6 per cent of the animals supplying hides for leather although it produces 70 per cent of the boots and shoes manufactured in the country, has comparatively little timber for manufacturing uses, no copper and but 4 per cent of the iron ore mined in the country although turning out about 50 per cent of the pig iron and of the iron and steel manufactures as a whole. It produced in 1909 but about 7 per cent of the raw manufacturing material of the country although it turned out approximately 50 per cent of the manufactures. Clearly, it was generally dependent upon the other sections of the country for most of the $6,500,000,000 worth of manufacturing material which its factories used in 1909, the year covered by the latest detailed census reports, those of 1910. The cotton it brought from the South, the iron ore from the upper Mississippi, the copper from the mountain region, the timber from the South and the upper Mississippi and most of the foodstuffs which it consumed were from the upper Mississippi Valley. For these, it paid chiefly with its manufactures.

The Upper Mississippi Section is equally distinctive in its products and equally dependent upon other sections of the country for certain of its requirements. This section includes the States of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Missouri, Iowa, Kansas, Nebraska and the Dakotas. With an area forming about 25 per cent of the entire United States exclusive of Alaska it has 32 per cent of the population of the country. It is clearly the great grain and meat producing section of the United States. It produces about 75 per cent of the wheat of the country, 70 per cent of the corn, 50 per cent of the potatoes, 50 per cent of the butter, 45 per cent of the food animals and turns out 55 per cent of the flour and 70 per cent of the products of slaughtering and packing. It produces 58 per cent of the value of all foodstuffs turned out in the United States and the value of its farms is 57 per cent of that of the entire country. Of manufacturing material, it produces about 20 per cent stated in value, of the entire manufacturing material of the country. The total of its manufactures in 1914 was nominally about 33 per cent of those of the entire country, though a very considerable part of these so-called manufactures consisted merely of meats and flour which the census classes as manufactures, though in fact foodstuffs. Having 45 per cent of the food animals of the country, it turned out in 1914 75 per cent of the products of slaughtering, having plentiful timber supplies; it manufactures 80 per cent of the agricultural implements, 70 per cent of the automobiles and 50 per cent of the furniture, and producing 75 per cent of the wheat of the country, it turns out 60 per cent of the flour. Producing 85 per cent of the iron ore of the country and about 25 per cent of the coal, it turns out 33 per cent of the pig iron and 30 per cent of the manufactures of iron and steel. Producing no cotton, little wool or other fibres for industrial purposes, it relies almost exclusively upon the North Atlantic section for its manufactures of cotton and wool and silk and fibres, also for its chemicals and many other high grade manufactures and those of a miscellaneous character. For these, it exchanges its wheat and flour and food animals and meats and furniture and automobiles, while it also pays with like products for the minerals and sugar and fruits and live stock which it brings from the southern and western sections of the country.

The Southern Section which includes all of the States south of the Potomac and Ohio rivers and extending to the western boundaries of Texas and Oklahoma has 30 per cent of the area of the country and 32 per cent of the population. Its industries are chiefly agriculture, forestry and mining. It produces practically all of the cotton of the country, about 18 per cent of the cereals, 28 per cent of the food animals, over 50 per cent of the petroleum and has 40 per cent of the farm acreage of the country. It turns out about 30 per cent of the value of farm products of the country, and 24 per cent of the value of the foodstuffs of the United States. With its monopoly of cotton production, and its valuable minerals and forests, it supplies about 50 per cent of the raw material required for manufacturing. It supplies 26 per cent of the coal, over 50 per cent of the petroleum, all of the raw cotton and practically all of the sulphur produced in the United States. Producing 50 per cent of the country's raw material for manufacturing, it turns out but 14 per cent of the total value of manufactures produced in the United States, and the capital invested in its factories is but about 12 per cent of the total manufacturing capital in the entire country. It produces about 40 per cent of the cotton goods manufactured in the United States, 34 per cent of the lumber and 10 per cent of the manufactures of iron and steel but comparatively little in other lines of manufacture. For all of its woolen and silk goods, its manufacture of fibre, its higher grade cottons, its chemicals and most of its iron and steel manufactures, it depends on the North Atlantic Section; for the bulk of its automobiles, cars, carriages and for farm machinery it depends upon the Upper Mississippi Section. For these it exchanges its natural products, cotton, petroleum, sulphur, tobacco, live cattle and its partly manufactured product — lumber.

The Mountain Section covers the entire area from the western boundary of Texas, Kansas, Nebraska and the Dakotas to the waters of the Pacific. It has a larger area than any of the others, about 40 per cent of the entire country exclusive of Alaska, but only 7 per cent of its population against 32 per cent in the Southern Section, 32 per cent in the Upper Mississippi Section and 29 per cent in the North Atlantic Section. It produces but 6 per cent of the manufactures of the country, 5 per cent of the cereals, 9 per cent of the foodstuffs, has but 12 per cent of the acres in farms, 3 per cent of the swine, 15 per cent of the cattle, but 55 per cent of the sheep of the country. Clearly it is not, mountainous as it is, a great agricultural or manufacturing section, though it does supply most of the beet sugar produced in the country, over one-half of the wool, and large quantities of fruits. Its chief products are minerals; it produces 80 per cent of the copper and practically all of the gold and silver produced in the United States, about 33 per cent of the petroleum, 25 per cent of the minerals of the country as a whole and about 20 per cent of the entire manufacturing material produced in the United States. Its sheep produce 65 per cent of the value of the wool product of the country and its forests 20 per cent of the lumber. Its natural products it must exchange for the food and manufactures of other parts of the country. While it turns out about 7 per cent of the total manufactures of the country, and its total population is about 7 per cent of that of the entire United States, it does not follow that it is self-sustaining in the matter of manufactures, for the output of its factories are composed of few articles, such as lumber, iron and steel, sugar and the products of slaughtering and packing leaving its population dependent upon the manufacturing sections, the North Atlantic, and the Upper Mississippi Section for its cotton, woolen and silk goods, its clothing, agricultural implements, cars, carriages and high grade manufactures of iron and steel and miscellaneous products. For these it exchanges its minerals, wool, fruits and sugar.

The four great requirements of man are food, fuel, manufacturing material and manufactures. The North Atlantic Section with 6 per cent of the area of the United States and 29 per cent of its population produces 50 per cent of the manufactures and 33 per cent of the fuel but only 9 per cent of the food and 7 per cent of the manufacturing material of the entire country. The Upper Mississippi Section with 25 per cent of the area and 32 per cent of the population produces 60 per cent of the food, 33 per cent of the fuel, 21 per cent of the manufacturing material and 33 per cent of the manufactures though about one-fourth of its so-called manufactures are merely the products of slaughtering and milling which are scarcely entitled to be classed manufactures. The Southern Section with 30 per cent of the area and 32 per cent of the population produces 23 per cent of the food, 28 per cent of the fuel, 50 per cent of the manufacturing material and 6 per cent of the manufactures. The Western Section with 40 per cent of the area and 7 per cent of the population produces 20 per cent of the manufacturing material, 13 per cent of the fuel, 9 per cent of the food and 7 per cent of the manufactures of the country.

Thus the great economic principle of a division of labor among men, which had been unconsciously but consistently developed in world industries, has been also unconsciously applied in the United States. The North Atlantic Section, producing one-half of the manufactures, exchanges them for the food of the Upper Mississippi Section and the manufacturing material of the South. The Upper Mississippi Section, producing 60 per cent of the food, exchanges it for the manufactures of the North Atlantic Section, the food animals and lumber of the Southern Section and the minerals, sugar and fruits of the Mountain Section. The Southern Section produces its cotton and oil and timber and sulphur and sugar and exchanges them for the manufactures of the North Atlantic and the Upper Mississippi Sections of the country. The Mountain Section produces its minerals and wool and sugar and fruits and exchanges them for the manufactures of the North Atlantic and Upper Mississippi Sections and the sub-tropical products of the Southern Section.

These exchanges between these great areas of the United States having products with distinctly varying characteristics form the bulk of the internal commerce of the country in which the value of the merchandise is twice as great as that forming the entire international commerce of the world.

PRINCIPAL PRODUCTS OF THE FOUR GREAT INDUSTRIAL SECTIONS OF THE UNITED STATES, ALSO AREA AND POPULATION

	North Atlantic Section	Upper Mississippi Section	Southern Section	Mountain Section	Total
Area, square miles	171,000	767,000	901,000	1,189,000	3,028,000
Population, 1916	29,000,000	32,000,000	32,500,000	8,500,000	102,000,000
Foodstuffs produced, 1909	$616,000,000	$3,973,000,000	$1,607,000,000	$592,000,000	$6,788,000,000
Fuel produced, 1909	$189,000,000	$182,000,000	$160,000,000	$75,000,000	$606,000,000
Manufacturing material used, 1914	$6,338,000,000	$5,192,000,000	$1,916,000,000	$919,000,000	$14,368,000,000
Manufactures produced, 1914	$11,047,000,000	$8,574,000,000	$3,130,000,000	$1,506,000,000	$24,247,000,000
Capital invested in manufacturing	$11,000,000,000	$7,000,000,000	$3,000,000,000	$2,000,000,000	$23,000,000,000
Coal produced, 1915, tons	220,000,000	105,000,000	124,000,000	25,000,000	474,000,000
Iron ore produced, 1915, tons	2,000,000	47,000,000	6,000,000	1,000,000	56,000,000
Pig iron produced, 1915, tons	19,000,000	14,000,000	5,000,000	1,000,000	39,000,000
Iron and steel manufactures, 1914	$1,077,000,000	$828,000,000	$188,000,000	$90,000,000	$2,183,000,000
Copper produced, 1915, pounds	....	250,000,000	76,000,000	1,060,000,000	1,386,000,000
Silver produced, 1916	....	....	....	$37,400,000	$37,400,000
Gold produced, 1916	....	$8,000,000	....	$86,000,000	$94,000,000
Petroleum produced, 1915, bbls	9,000,000	30,000,000	150,000,000	91,000,000	280,000,000
Lumber produced, 1914	$220,000,000	$310,000,000	$480,000,000	$225,000,000	$1,235,000,000
Cotton produced, 1916, bales	....	130,000	11,381,000	....	11,511,000
Cotton manufactures, 1914	$420,000,000	$25,000,000	$245,000,000	$10,000,000	$700,000,000
Wool produced, 1915	$3,000,000	$20,000,000	$6,000,000	$36,000,000	$65,000,000
Woolen manufactures, 1914	$355,000,000	$30,000,000	$5,000,000	$5,000,000	$395,000,000
Silk manufactures, 1914	$245,000,000	$10,000,000	....	....	$255,000,000
Boots and shoes manufactured, 1914	$410,000,000	$180,000,000	$6,000,000	$4,000,000	$600,000,000
Automobiles, 1914	$150,000,000	$450,000,000	$15,000,000	$15,000,000	$630,000,000
Farms, 1909, acres	65,408,000	350,677,000	352,441,000	110,861,000	879,387,000
Farm property, 1909	$3,890,000,000	$23,554,000,000	$8,909,000,000	$4,538,000,000	$40,891,000,000
Farm products, 1909	$1,092,000,000	$4,934,000,000	$2,976,000,000	$848,000,000	$9,850,000,000
Cereals, all, 1909, bushels	200,000,000	3,320,000,000	780,000,000	215,000,000	4,515,000,000
Wheat, 1915, bushels	37,000,000	682,000,000	126,000,000	158,000,000	1,003,000,000
Corn, 1915, bushels	120,000,000	1,890,000,000	972,000,000	25,000,000	3,007,000,000
Milling products, 1914	$130,000,000	$526,000,000	$175,000,000	$45,000,000	$876,000,000
Potatoes, 1915, bushels	90,000,000	170,000,000	52,000,000	48,000,000	360,000,000
Sugar, 1915, pounds	....	290,000,000	493,000,000	1,160,000,000	1,943,000,000
Food animals, 1910	10,460,000	79,032,000	50,435,000	41,026,000	180,953,000
Cattle, 1910	3,770,000	30,007,000	20,390,000	9,446,000	63,613,000
Swine, 1910	2,360,000	36,150,000	21,085,000	1,880,000	61,475,000
Sheep and goats, 1910	2,330,000	14,875,000	8,960,000	29,700,000	55,865,000
Slaughtering products, 1914	$237,000,000	$1,310,000,000	$75,000,000	$50,000,000	$1,672,000,000

NOTE.— The *North Atlantic Section* includes the New England and Middle States.

Upper Mississippi Section: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Missouri, Kansas, Nebraska and the Dakotas.

Southern Section: All States south of the Potomac and Ohio rivers extending to the western boundary of Texas and Oklahoma.

Western Section: All States west of Texas, Oklahoma, Kansas, Nebraska and the Dakotas.

The table which follows shows the principal products of the four great industrial sections of the United States: the North Atlantic Section, whose chief industries are manufactures; the Upper Mississippi Section, the chief producer of foodstuffs; the Southern Section, providing the cotton and other raw materials; and the Mountain Section, producing the minerals and wool.

OSCAR P. AUSTIN,
Statistician, National City Bank of New York.

COMMERCE, Interstate. Complete freedom of trade among the States was established by the Federal Constitution. The States were forbidden to «lay any duties on imports or exports» or «to lay any duty of tonnage.» Congress itself was denied the power to levy taxes or duties on articles «exported from any State»; so that the flow of commodities from State to State was freed of any danger of interruption through customs, or other charges, imposed by Federal authority and to be collected at State boundaries or ports of entry. At the time of the adoption of the Constitution the «commerce with foreign nations and among the several States," which Congress was empowered to regulate, was almost exclusively water-borne. Overland traffic was practically non-existent; the cost of transportation of heavy commodities, in large quantities and for long distances, was prohibitive. Interstate commerce, then and long after, meant trade conducted by schooners, sloops and "yankies" on the bays, sounds and estuaries skirting the Atlantic shore; and there was little thought of exercising the regulative powers of Congress over any other. The only national legislation on the subject for half a century after the foundation of the government was that contained in the Navigation laws, whereby the coasting trade between ports of the United States was required to be conducted in vessels of American registry, American-owned and American-built. When steam-propelled vessels had come into general use, and laws for the inspection of steamboats and the licensing of masters and engineers were enacted by Congress, this legislation applied, of course, to all steam vessels, including those engaged in traffic on rivers and lakes wholly within the territorial limits of a single State. With respect to overland traffic on the other hand, there are instances on record where States incorporated transportation companies, with exclusive rights of running their stage coaches and wagons over roads in other States. The earliest Federal activity with respect to overland communication, which might inferentially be called a regulation of commerce, was the establishment of the pre-existing postal system as a governmental service. The next in time and importance was the construction of the Cumberland Road, or "National Pike," from Cumberland, Md., through Wheeling and Columbus. This highway, begun in 1806, finally reached Vandalia, on the Kaskaskia River, in 1827. It had been intended to project this road to Jefferson, Mo., but long before its construction had progressed to the Mississippi River line the superiority of the railroad for long-distance overland traffic had been demonstrated. As early as 1772 George Washington had directed attention to the need of improving the means of inland communication by roads, rivers and canals. Especially desirable, in his estimation, was a through route from the seaboard to the region west of the Alleghany Mountains; but this was not realized until, 26 years after the death of Washington, a connection between the Great Lakes and the Hudson River was established by the completion of the Erie Canal. The first direct assertion by Congress of the right to regulate overland commerce among the States was the act of 15 June 1866 (31 Statutes at Large, 1446, chap. 866) which provides as follows: "Every railroad company in the United States is authorized to carry . . . all passengers, troops, government supplies, mails, freight and property on the way from State to State, and connect with the roads of other States, so as to form continuous lines for the transportation of the same to the place of destination." This has been called, not inappropriately, the "Magna Charta" of the interstate railways.

Long before this, however, the potentialities latent in the "Commerce Clause" of the Constitution had been disclosed by the courts. The epochal case of Gibbons v. Ogden (9 Wheaton 1) turned on the interpretation of the word "commerce." The State of New York had granted an exclusive right of navigation over its territorial waters; but the court decided that commerce includes navigation, so that, in making a grant of the character described, the State had exceeded its powers and encroached upon those of the United States. In the written opinions of Chief Justice Marshall and his associates on the Supreme Bench the superior and exclusive authority of Congress is declared with the greatest possible emphasis. The power of Congress to regulate commerce "is complete in itself, and may be exercised to its utmost extent, acknowledging no limits other than are prescribed in the Constitution." The power is plenary, because it is vested in Congress "as absolutely as it would be in a single government"; it may be exercised "whenever the subjects exist." "If there was any one object riding over every other in the adoption of the Constitution, it was to keep commercial intercourse among the States free from all invidious and particular restraints. . . . In all commercial regulations we are one and the same people." In the ensuing years the scope of the Federal authority was determined mainly by decisions of the United States courts enjoining the enforcement of State regulations, or the collection by the States of tolls and taxes, deemed to be obstructive of or burdensome on interstate commerce. With the opening of the railroad era overland traffic steadily gained on navigation in relative importance; but the idea of the "Commerce Clause" as a check upon hindering legislation by the States, rather than as an invitation to Federal regulation, persisted. As late as 1869, in the State Freight Tax case (15 Wallace 232) Justice Strong still adhered, and gave expression, to this idea — saying, that when this clause was framed, "a power to prevent embarrassing restrictions by a State was the thing desired." Pennsylvania had placed a tax on all charges made by railroads for the transportation of freight within the State and, though the impost was on earnings and not, directly, on the commodities carried, and though no discrimination was made in favor of local traffic, it was declared to be a toll on interstate commerce and its collection was inhibited. In the Covington Bridge case the establishment of toll rates on the bridge from Cincinnati to Covington was declared to be a regulation of interstate commerce and, therefore, not within the legislative power of a State. And this notwithstanding the fact that the regulation of ferries, even when operated across rivers forming State boundaries, had always been regarded an exclusive function of the adjacent local authorities. The right of a State to prohibit the entry of intoxicating beverages was denied, when the goods were imported in the "original packages" as articles of interstate commerce. The law on this subject has been recently changed, however, and such shipments are now excluded by act of Congress from States which prohibit their entry. The imposition of license fees on persons or employments, even though not discriminatory, have been declared unlawful when they were, in effect, regulations of interstate commerce; for instance, when imposed on persons soliciting orders for goods or freight to be shipped into or out of a State to or from another State.

Several years ago the United States Circuit Court sitting at Minneapolis forbade the execution of a new Wisconsin grain inspection law, on the ground that the Minnesota system of grain inspection had become practically an interstate system by custom of the trade.

Laws passed by States in the exercise of their police powers, however, are valid, though they may incidentally affect interstate commerce. The States may exclude persons or goods by quarantine; regulate or restrict the sale of merchandise by pure food laws or other legislation in the interest of public health or morals; regulate the use of highways; impose conditions on the conduct of business by foreign corporations within their limits, and oust corporations or associations which have been declared monopolies. In a few cases which involve direct regulations of interstate commerce — for instance, the transportation, or storage for transshipment, of explosives — State laws have been held operative in the absence of Federal regulations on the subject. But it is the «elementary and long-settled rule that there can be no divided authority over interstate commerce, and that regulations of Congress are supreme. In cases where, from the particular nature of the subject, the State may exert authority until Congress acts, it is under the assumption that Congress by inaction has tacitly authorized the State to do so. Action by Congress, though not expressly inhibitive, destroys the possibility of such assumption, since such action covers the whole field and renders the State impotent.»— Southern Railway Co. v. Reid (1912), 222 U. S. 424; Railway Co. v. Hardwicke Farmers' Elevator Co. (1913), 226 U. S. 426.

The gigantic extension of the railroads of the country in the decade following the Civil War resulted in a complete change in the aspect of our commercial problems. Not interstate commerce, but the most important instrumentality thereof, appeared to be in urgent need of regulation. The authority given by the act of Congress of 15 June 1866 had facilitated railroad connections and the establishment of continuous lines, overleaping the boundaries of States and defying their control. The railroads thus connected were consolidated by merger, or by lease, into great interstate systems, competition among which was stifled by pooling agreements. New lines projected as competitors to existing ones were bought out, or frozen out by means of stock jobbery or legal and political sculduggery. Of the many evils growing out of uncontrolled railroad operation the greatest of all was the practice of discriminating in service and rates between individual shippers and localities. Favored shippers were enriched at the expense, and often by the ruin, of business rivals, who had to pay more for service, if they got it at all. The prosperity of towns and whole sections, with the farms, mines and industries they contained, were dependent upon the good will of those who commanded the means of communication and transportation. The Granger movement, which started about 1870, resulted in the enactment of stringent regulative laws in the States of the Northwest and Middle West. Local legislation, however, was of little avail. More than two-thirds of the railroad traffic was interstate and lay wholly outside of State control. Nearly all of the grain and other produce that went into the elevators and warehouses was intended for transshipment to other States, or for export to foreign countries. Neither could terminal services be effectively regulated, nor could unfair and discriminative through rates be prevented. The only limitation on charges was «what the traffic would bear.» The first attempt at regulation by Congress was made in 1873, when a bill was introduced to forbid any railroad company to charge more per mile for a short, than for a long, haul. This crude measure, which took no account of the «rule of diminishing cost,» was very properly defeated. Judge Reagan, of Texas, introduced into the House of Representatives in 1878 a series of bills covering the whole subject, some provisions of which ultimately found their way into the Cullom bill. Not until nine years later, however, was this bill finally passed as the Interstate Commerce act of 4 Feb. 1887. The principal objects of this law, as defined by the Supreme Court, are: «to secure just and reasonable charges for transportation; prohibit unjust discrimination in the rendition of like services under similar circumstances and conditions; to prevent undue preferences to persons, corporations or localities; to inhibit greater compensation for shorter than for longer distances over the same lines; and to abolish combinations for the pooling of freights.»— Interstate Commerce Commission v. Baltimore (1892), 145 U. S. 263.

The law at first was made applicable to carriers wholly by rail or partly by rail and water, and to the instrumentalities of shipment and carriage. Transportation on water routes, by navigation companies or individual owners, operating their lines or vessels independently and not under direction of a railroad as components of a combined rail and water route, was not in the purview of the law. The Hepburn act of 29 June 1906 extended the act to pipe lines and specified with great particularity the «services required in connection with the receipt, delivery and transfer in transit, ventilation, refrigeration, elevation, storage or handling of property transported»; the Mann-Elkins law of 18 June 1910 included telegraphs, telephones (wire or wireless) and cables, also express companies, sleeping car companies, bridges and ferries. The pooling of freights having been absolutely prohibited by the Interstate Commerce law efforts were at first made to secure a uniformity of rates by agreement among the member railroads in each of the several regional traffic associations. Such agreements, however, were declared by the Interstate Commerce Commission, which had been created to administer the law, and by the courts, to be in violation of the Sherman Anti-Trust law, being «contracts in restraint of trade.» But, inasmuch as the whole spirit of the law was the principle of equality, and preferences among localities similarly situated were expressly forbidden by the act, the inevitable consequence was a practical identity of rates and classifications of freights in each of the regions covered by the traffic associations. Regulation had superseded competition as the means of adjustment. Nevertheless, mergers or combinations of parallel and competing lines and systems are prevented by State laws, which have been declared valid by the United States Supreme Court; and the same court unscrambled the Northern Pacific and Great Northern merger, and dissolved the combination, through stock ownership, between the Union Pacific and Southern Pacific systems. The prohibition in the original act of lower rates for a long haul than for a shorter haul was unconditional; but the commission, with the concurrence of the courts, applied the qualifying phrases attached to other provisions of the law so that, where a railroad between two given terminals is in competition with an all water route, or a foreign overland route out of the jurisdiction of the commission, it was decided that there was «a substantial difference in the circumstances» such as would warrant the establishment of a lower through rate for the longer haul from terminal to terminal than for a shorter haul to intermediate points on the same line. By the Hepburn act rate-making of this character was finally and definitely authorized. The same law also abolished the right to a judicial review of the commission's orders, making the rates established by it unappealable except on constitutional grounds — as being denials of the equal protection of the law, or involving the taking of property without compensation. The requirement to construct and operate switch connections by request of any lateral or branch line or shipper, if practicable and justified by the business furnished, and the «commodities clause,» which forbade railroads to haul coal from mines owned or controlled by them, were other features of the Hepburn law.

It was found necessary several times to increase the severity of the penalties provided by the original law for discriminations in rates and services. The Elkins act of 4 Feb. 1903 made the giving of rebates, or the granting of any special favors which were differentials in effect, punishable by the imprisonment of the agents or officers responsible for the wrong, as well as by the imposition of a fine on the bodyless and soulless corporation. But the principle of selling cheaper at wholesale than at retail has been declared by the courts to be operative in the sale of transportation, just the same as in the sale of other services or of commodities. The existence of «large shippers under single control, sending continuous quantities at stated and regular intervals, also weight and bulk, convenience or inconvenience, may be considered in rate making.»— Interstate Commerce Commission v. Chicago & Great Western Railroad Company (1908), 209 U. S. 108.

In determining the reasonableness of a charge the interests of the carrier, the shipper and the public must all be considered; the cost of service to the carrier would be an ideal basis, but is impracticable; the value of the service to the shipper is a factor; also the density of traffic, the ability of some traffic to bear a greater charge than some other, having regard for the character of the commodities and the locality or other circumstances of production; and rates may be unreasonable because too low. As a downward limit the courts have fixed the sufficiency of the rates to produce 6 per cent on capital, over and above operating cost and fixed charges. Pursuant to this suggestion the Interstate Commerce Commission, by the act of 1 March 1913, was directed to make a physical valuation of all railroad property in the United States, the assumption being that the value so found would be less than the nominal value of the stock in the hands of shareholders, and copious infiltrations of «water» could be squeezed out of the nominal capitalization.

The Panama Canal act of 24 Aug. 1912 made it unlawful for any railroad to own, lease, operate, control or have any interest (by stock ownership directly, or indirectly through a holding company or individual stockholders) in any carrier by water or any vessel carrying freight or passengers operated on any water route with which it (the railroad) does or may compete. By this act also the Interstate Commerce Commission was authorized to require the establishment of physical connection between the lines of carriers by rail and the docks of carriers by water by means of spur tracks. The connection must be reasonably practicable, and the amount of business must justify the outlay; the commission to apportion the cost of installation and determine the conditions and charges of operation. The law applies even when the dock belongs to neither carrier, so that piers owned by municipalities or independent wharfingers are brought under Federal regulation. The commission may determine through-routes and maximum joint rates; establish maximum proportional rates by rail to and from ports, to and from which traffic is carried by water. Any carrier by rail entering into engagements with a carrier by water for handling through business may be required to enter into similar arrangements with any or all lines of steamships operating from the same port. By this law of Federal regulation of rates, authority was still halted at the water fronts; moreover, ferries unconnected with transportation by rail appear to be still under exclusive State jurisdiction. This is so even when the «ferry boats» have to go 20 miles across the high sea as they do from San Pedro, Cal., to Santa Catalina Island. Consult Wilmington Transportation Co. v. California R.R. Commission (1915), 236 U. S. 151. The Sherman Anti-Trust law of 2 July 1890, though it purports to be an act «to protect trade and commerce against unlawful restraints and monopolies» was at first declared inapplicable to a monopoly in the production of a necessary of life, which is transported to, and sold in, every corner of the land. But the sugar trust decision has long since become obsolete and the prohibition of the Sherman law of trading in trust products makes it a most effective regulative of interstate commerce. The power of Congress to prohibit, as well as to regulate, trade is invoked also in the Federal Meat Inspection and the Food and Drug laws. But the act of Congress prohibiting interstate commerce in the products of child labor has been declared unconstitutional by the United States Supreme Court, though by a bare majority. The Interstate Commerce Commission has nothing to do with the administration of these laws and the regulation of transportation and rates on salt water routes, which the government has at last assumed, is in the hands of the United States Shipping Board.

The regulative powers of the Interstate Commerce Commission have been practically suspended by the establishment, as a war measure, of a Directorate General, whereby the government has assumed complete control of railroad operations; though the commission continues to receive from the corporations owning the lines, as required by law, monthly financial reports, including reports of operating income. One of the first acts of the Director General was to abolish many of the wasteful methods induced by competition for business and to coordinate facilities in order to promote efficiency in service. Whatever else the future may bring forth, it is certain that the railway and other inland routes of transportation will hereafter be considered as interrelated parts of one great system.

STEPHEN PFEIL.

COMMERCE OF THE WORLD, International. World commerce is primarily the interchange of the products of its great natural divisions. Nature gave to the world three great natural divisions: the broad tropical belt stretching around the globe at the equator, and on either side of this a temperate zone. Between the 30th parallel of north latitude, which runs through New Orleans, Cairo and Shanghai, and the 30th parallel of south latitude, which runs through Southern Brazil, the southern tip of Africa and the southern part of Australia, the products are chiefly tropical. North and south of these lines the products are chiefly temperate. Curiously, the area between these two lines, the 30th degree north and the 30th south, is about one-half of the land surface of the globe, exclusive of the Arctic and Antarctic regions. That tropical area has, too, about one-half of the world's population. Its products — cotton, silk, hemp, sisal, jute, rubber, hides, sugar, tea, coffee, cacao and fruits — are demanded by the people of the temperate zone for food and clothing and for use in manufacturing. The temperate zones, with one-half of the world's area and population, produce the cereals, meats and other foodstuffs, and are the great manufacturing section of the world. These products of the temperate zones are demanded by the people of the tropics, for food, clothing and the requirements of their domestic and industrial life. So there are great and perfectly natural interchanges of the natural and artificial products of these two great climatic sections of the globe, the temperate zones and the tropics.

Nature, however, not content with these climatic divisions of the earth's surface, also subdivided them by the creation of continents and islands, separating them by great oceans, across which the various products of these climatic divisions must be transported by vessels. To add to this complication of interchanges, certain of these natural sections were populated and their producing powers developed long before others of them. Western and southern Europe, northern Africa, India, China and the Euphrates valley, were the seats of a busy population long before America, central and southern Africa, Australia, or the islands of Oceania were peopled or began to contribute their products to the requirements of the world.

It is the interchanges between these great sections of the globe and the various countries into which they are subdivided which we call international commerce. The exchanges began in a small way, with commercial caravans passing between Egypt and the Orient, and coasting vessels creeping along the waterfronts of southern and western Europe. But these exchanges were of comparatively little value, and it was not until the introduction of the compass when men learned that the oceans were a highway and not a barrier to commerce that trade between the great natural divisions and subdivisions really began.

It is not surprising, then, to find that the international trade of the world in 1700 was but about $350,000,000, of which about $200,000,000 was conducted by Europe and the remainder by Asia and America. Great Britain was then, as she has been ever since, the leader of commerce, her trade amounting in 1700 to about $50,000,000 a year, Spain $40,000,000, France and the area which we now call Germany about $25,000,000 each, Spanish America and the East Indies $40,000,000 each, and the British colonies $10,000,000. By 1750 world commerce had doubled, amounting to about $750,000,000, and by 1800 it doubled again, reaching $1,500,000,000 at that date, these figures being a rough aggregate of the imports and exports of all the countries of the world at that time.

In the next half century, however, a series of events changed entirely the commercial movements of the world and greatly stimulated commerce, multiplying the interchanges and stimulating development and the producing powers of the hitherto undeveloped regions of the globe. In 1819 a little vessel of 300 tons, the *Savannah*, crossed the ocean from the United States to Great Britain by steam power, and gave to the astonished world a lesson in multiplying the usefulness of the oceans in commerce, and at the same time reducing greatly the cost of interchange between the great natural divisions. About the same time man learned to transport merchandise and people on land by the use of steam power, the railway. The result of these two great contributions to transportation and commerce was that in the year 1850 there were upon the oceans nearly a million tons of steam vessels and on land 25,000 miles of railways, and international commerce in that year was about $4,000,000,000, or nearly three times as much as in 1800.

From that time international trade grew by leaps and bounds. By 1870 it was $10,000,000,000, and by 1900 $20,000,000,000. Even this rapid increase, however, was outdone in the opening years of the present century, for in 1913, the year before the opening of the great European War, the international trade of the world was $40,000,000,000, having actually doubled in the short period 1900–1913.

The causes of this rapid growth following the application of steam to transportation were the opening of new areas to population and production, a reduction in the cost of transportation by which many articles were added to the list of international exchanges, the increased facility of intercommunication by the mails, the telegraph, the telephone and the wireless telegraphy, the increase of money and of banking power, and the development of great manufacturing systems, which supplied their products to all the world and took in exchange the manufacturing material from all sections of the globe. Steam vessels on the ocean grew from 1,000,000 tons in 1850 to 30,000,000 in 1913; railways from 25,000 miles to 700,000, and telegraphs and ocean cables from 5,000 miles to about 2,000,000. World currency enormously increased and the banking power of the world grew from $3,000,000,000 in 1850 to $65,000,000,000 in 1913. Meantime world population increased with extreme rapidity, the result of the opening of new areas to population and production; and with the transportation of plentiful food supplies from the new areas, world population which was but little more than 1,000,000,000 in 1850 grew to 1,600,000,000 in 1913, and the producing and purchasing power of each man greatly increased. North America, which had in 1800 but about 7,000,000 people had in 1900 about 140,000,000, and in many other areas the development of population and producing power was phenomenal.

With the increase of transportation there came a great reduction in the cost of moving merchandise between the continents and climatic sections. The wheat and corn and meats, and cotton and other manufacturing material of North America were transported to Europe and the manufactures of that continent sent in exchange; the meats and wool and hides and grain of South America and Australia crossed the equator to Europe, and were also paid for in manufactures; and the tea and coffee and cacao and spices and sugar and fruits and manufacturing materials of the tropics were sent to the north temperate zone in great quantities, and paid for in the products of the farms and factories of the temperate zones, upon which the tropics rely for their flour and meat as well as clothing and other manufactured articles.

The wonderful growth of the world's commerce is pictured in tables presented herewith. One of these shows the total world trade and the trade of each grand division at 25-year intervals from 1800 to 1900, and also in 1913 and 1916, showing not only the total commerce at each period, but the population and the average per capita commerce at each of the dates, both for the entire world and for each grand division. Another table shows the commerce of each of the principal countries of the world, imports and exports separately, at intervals from 1850 down to 1916, though in certain of the countries at war the commerce of 1916 can only be estimated by reason of the absence of official figures. Care has been exercised in the preparation of these tables to include only the domestic exports of merchandise of the various countries, omitting the precious metals and the foreign merchandise re-exported, though in certain of the smaller and newer countries this has been impracticable.

An examination of these tables of imports and exports of the various countries will disclose the fact that in many of the older countries, notably those of Europe, the imports constantly exceed the exports, while in the newer countries exports are greater than imports. This excess of imports by the European countries is due to the fact that they are compelled to draw upon other parts of the world for a large proportion of their food and manufacturing material, and as they have little except manufactures to offer in exchange their imports in most cases exceed their exports, the difference being made up by the earnings of their steamships, the earnings of their capital invested abroad, the profits upon the merchandise imported and re-exported. Many of the countries of Europe have, however, considerable quantities of natural products to export, which is in some degree an offset to the general fact that manufactures are the chief exportable material of that part of the world. Great Britain, for example, exported prior to the European War large quantities of coal, which she sent to all parts of the world largely as ballast for her ships carrying the lighter products, manufactures, and scouring the world for foodstuffs and manufacturing material as the return cargo. Some of the coal she supplied to the adjacent countries of Europe, taking in exchange the beet sugar of Germany, Russia and Austria; the iron of Spain and Sweden; the lumber and timber and wood pulp of Norway, Sweden and Russia; the copper of Spain, and the cork of Portugal, though much of this she paid for in certain manufactures. The imports of Europe as a whole, as shown elsewhere, are normally less than those of the exports, while in America, Africa and Oceania the exports exceed the imports. In the case of the United States the exports have for many years exceeded the imports by from $300,000,000 to $600,000,000 per annum, and in most of the South American countries and Australia the exports also exceed the imports, and this is also true of most of Africa. Tables presented herewith show the total imports and exports of the countries forming each continent, and also the excess of imports or exports, also the total imports and exports of certain principal countries of the world for a series of years. It will be noted that the aggregate trade of the countries of each grand division other than Europe shows larger exports than imports, while in Europe the imports exceed exports by $2,700,000,000 in 1913, the latest normal year.

The table showing the imports and exports of the countries forming each continent and therefore the aggregate of the international commerce of the world shows for the year 1913, the latest normal year, $21,400,000,000 of imports and but $19,550,000,000 of exports, and indicates that the stated value of the world imports therefore exceeded that of exports by $1,850,000,000. When we reflect that all the exports necessarily become imports in some other part of the world (except any part which may have been lost en route) we might expect that the stated value of the imports would about equal that of the same articles when exported from the country of their production. But it is a fact that the stated total of imports is in most instances greater than the stated value of the same merchandise when exported. It is not unusual for the grand totals of world imports to exceed the grand total of exports by about 10 per cent. This discrepancy between the stated value of the merchandise when exported and again imported is accounted for in part by the value added by cost of transportation, and in part by the fact that the countries importing the merchandise are likely to give it a slightly higher valuation than did the countries from which it was originally exported, by reason of the fact that much of the merchandise when imported pays an ad valorem rate of duty, and the authorities are on the alert to give to it as high a valuation as circumstances will justify, while as few countries have an export tax the merchandise when exported is not subjected to so close scrutiny in determining its full value. The suggestion that the cost of transportation is added to the valuation of the merchandise when imported, does not however apply to the United States, which, by law, accepts as the value of its imports the valuation declared before the United States consul when it is sent to the United States.

It will be seen from the above discussion of the valuation of the merchandise when leaving the country of exportation and again on entering the country of importation that the value of the merchandise is stated both when it leaves the country of origin and again when imported, and that the real value of the merchandise forming the international commerce of the world is therefore but about one-half of the usual figures of "world commerce." Records of world international trade are formed by aggregating the imports and exports of all countries of the world, and while we can only determine the value of the trade of any given country by aggregating its imports and exports, it must be remembered that the aggregation of the imports and exports of all the countries of the world necessarily counts the merchandise twice, once when it leaves the country of production as an export, and again when it enters some other country as an import, and that when we say that the international commerce of the world in 1913 was $40,000,000,000 we therefore mean that the value of the merchandise forming that trade was but about one-half that sum, or say $20,000,000,000, since its value was counted twice, once as it left the country of production as an export and again when it entered the country of its destination as an import.

The inter-continental trade of the world is much less than is usually supposed. Much of the trade of the various countries occurs with adjacent or neighboring countries, on the same continent. The trade of the United States with Canada, for example, which now amounts to over a billion dollars a year, is properly considered international commerce, yet none of it leaves the continent, and our trade with all of the North American countries in 1917 was nearly $2,000,000,000. In fact, only 64 per cent of the imports of all the North American countries in 1913, the latest year of normal commercial interchanges, was drawn from other continents, and only 67 per cent went to other continents. Thus about one-third of the international trade of the North American countries in 1913 was intra-continental, or trade within the continent, while about two-thirds was inter-continental, or trade with other continents. During the war period, 1914 to 1918, with the lack of inter-continental transportation, the proportion of the intra-continental trade increased. In the case of Europe the intra-continental trade formed in normal years a larger share of the total than was the case with our own continent. Of the total imports by all the European countries in 1913, the latest year for which complete figures are available, only 44 per cent were drawn from other continents, and of their exports only 36 per cent was sent to other continents, the remainder in each case being intra-continental, or trade between the countries of Europe. Of the total international trade of the countries forming the continent of Europe, aggregating in 1913 in round terms $25,000,000,000, only $10,000,000,000 was with other continents, the other $15,000,000,000 being exchanges among the countries forming that continent. In the case of Asia the share of the international commerce which was intra-continental, or trade among the countries of that continent, was about 45 per cent and the share which was inter-continental was about 55 per cent. In South America, Africa and Oceania, where manufactures are the chief import and food and raw material the chief export, about 90 per cent of the trade is with other continents. Of the entire commerce of the world in 1913, the latest normal year, only 55 per cent occurred between the continents, the remaining 45 per cent being intra-continental, or trade between the countries of the continent of which they respectively formed a part, or in other words only a little more than one-half of the merchandise entering international trade leaves the continent in which it was produced. In the years of the great European War, in which ocean transportation was difficult and costly the share of the world trade occurring between continents was below normal.

This fact, that only about one-half of the world's international trade ever leaves the continent of its production, suggests a further inquiry, as to the share of the total world's products which enter international trade and the share which is exchanged between conti-

INTERNATIONAL COMMERCE OF THE WORLD, BY GRAND DIVISIONS 1913

World Divisions	Imports of all countries of the continent			Exports of all countries of the continent		
	Total imports	From other countries of the continent (intra-continental)	From other continents (inter-continental)	Total exports	To other countries of the continent (intra-continental)	To other continents (inter-continental)
	Million dollars	Million dollars	Million dollars	Million dollars	Million dollars	Million dollars
Europe	13,980	7,826	6,154	11,280	7,267	4,013
North America	2,822	1,027	1,795	3,273	1,059	2,214
South America	1,028	74	954	1,158	98	1,060
Asia	2,084	990	1,094	2,107	882	1,225
Africa	760	65	695	997	59	938
Oceania	695	47	648	805	44	761
Total, world	21,369	10,029	11,340	19,620	9,409	10,211

nents. This, however, cannot yet be determined for the entire world, or indeed for many of the countries, because of the fact that the facilities of measuring the value of all the products of the various countries are in most cases insufficient to render available accurate figures as to the total value of the produce and thus determine the share entering international or inter-continental commerce. In the case of the United States, however, it is estimated from official figures of the production of the various classes of articles, agricultural, manufactures, mines, forests, fisheries, etc., that the value of the total products in 1913, the latest normal year, was about $40,000,000,000, of which a little more than 6 per cent was exported, and of this but about two-thirds, or approximately 4 per cent of the total passed to other continents.

Attention has been called to the fact that a considerable part of the international commerce of the world is the interchange between the climatic sections, the temperate zones and the tropics. The strictly tropical sections now export about $3,500,000,000 worth of merchandise annually, and import about an equal quantity, and most of this is inter-continental trade. Their chief exports are sugar, rice, coffee, tea, cacao, rubber, silk, cotton, jute, hemp, sisal, hides, gums, tobacco and fruits, and it happens that certain of the important minerals of the world, notably tin, nitrates and much of the gold, silver, lead and copper are also mined in that section. Practically all of these go to the north temperate zone. This tropical belt could produce and supply much more of these important articles, all of which are demanded by the temperate zones for food and manufacturing, if they had railroad facilities to bring their possible products to the water's edge, where the temperate zone countries gladly send their vessels to get whatever the tropics have to offer. Thus about $3,500,000,000 worth of the $20,000,000,000 worth of merchandise entering international trade is now produced in the tropical belt, and most of it sent to the temperate zones, a large part of that trade being inter-continental while nearly all of this tropical production exported is paid for in the manufactures, breadstuffs and meats of the north temperate zone, and is thus chiefly inter-continental.

The remainder of the inter-continental trade, aside from that of the tropics is the interchange of the foodstuffs and manufacturing material of the newly-developed areas for the manufactures of those which have great manufacturing systems, Europe, the United States and Japan. The countries of the south temperate zone send their fresh meats in refrigerating vessels across the equator to the markets of Europe, where they arrive in perfect condition for consumption, also their wool and grains and hides and fibres and coffee and tea and sugar and fruits and metals, and most of these are received by the north temperate zone and paid for in manufactures, chiefly the products of Europe and the United States, for practically all the factory products of the world are produced in the north temperate zone, and chiefly in Europe, the United States and Japan. The total value of the manufactures produced by the factories of the world is normally about $70,000,000,000 per annum, of which approximately $7,000,000,000 or 10 per cents enters international trade, the other 90 per cent being consumed in the countries of production. Of this $7,000,000,000 worth of manufactures entering the international trade of the world the United States, in normal years, supplies about $1,000,000,000 worth, though the great increase in our exports of manufactures under the stimulus of the war gives reason to hope that we may permanently retain a larger share of the world's trade in manufactures after a return to peace conditions.

INTERNATIONAL COMMERCE OF THE WORLD, BY GRAND DIVISIONS AND TOTAL

YEAR	Total commerce, million dollars	Population, in millions	Per capita commerce
	Europe		
1800	$1,109	175	$6 34
1830	1,291	215	6 01
1850	2,812	269	10 45
1875	9,015	335	26 91
1900	13,170	408	32 93
1913	25,300	462	54 74
1916	(a)	465	(a)
	North America		
1800	140	12	$11 67
1830	235	20	11 75
1850	387	33	11 43
1875	1,265	65	19 46
1900	3,210	119	26 97
1913	6,092	135	45 18
1916	8,100	138	58 66
	South America		
1800	80	8	$10 00
1830	120	11	10 91
1850	298	19	14 27
1875	690	32	21 86
1900	1,011	48	21 07
1913	2,185	55	39 73
1916	2,010	57	35 44
	Asia		
1800	116	335	$0 38
1830	275	440	57
1850	428	619	79
1875	1,280	763	1 66
1900	1,634	802	2 14
1913	3,750	825	4 55
1916	3,840	828	4 59
	Africa		
1800	19	95	$0 20
1830	30	100	30
1850	64	107	59
1875	270	112	2 41
1900	560	120	4 66
1913	1,473	130	11 41
1916	1,500	132	11 39
	Oceania		
1800	14	15	$0 93
1830	20	20	1 00
1850	60	28	2 14
1875	240	35	6 86
1900	520	40	13 01
1913	1,500	45	32 89
1916	1,600	46	34 69
	Grand Total of World International Commerce		
1800	1,479	640	$2 31
1830	1,981	847	2 34
1850	4,049	1,075	2 93
1875	10,856	1,345	3 02
1900	20,105	1,543	13 07
1913	40,420	1,652	24 41
1916	(a)	1,677	(a)

(a) No figures are available for 1916 commerce of Central Powers of Europe. Totals and per capita for Europe and entire world cannot therefore be stated for 1916.

NOTE.— Figures are as far as possible those of imports for consumption and exports of domestic merchandise. In some cases, however, gold and silver are necessarily included with figures of commerce, notably in earlier years in America and later years in Africa and Oceania. Early figures are estimates of Mulhall and Malte-Brun.

OSCAR P. AUSTIN,
Statistician, National City Bank of New York.

COMMERCIAL ASSOCIATIONS.

Early Organizations.— There were but few commercial associations in the United States before the Civil War. As a rule, only the larger cities possessed them. The functions of these organizations were scarcely more than to hold annual meetings to elect officers and to have occasional banquets where local politicians spoke. The strictly commercial organizations frequently aimed to maintain a produce exchange and provide room-trading facilities in such staples as grain, cotton and tobacco. The larger of these associations compiled and published trade statistics in their annual reports. These early statistics are very interesting to the historian. The volumes of the New York Chamber of Commerce give statistics of the movement of freight by the Erie Canal. The Cincinnati reports chronicle the rise and fall of the Ohio River trade and give the figures for Western pork packing. The Saint Louis volumes contain an account of the lumber rafts of the Mississippi River, of the Galena lead trade, of the furs and gold brought down from the upper waters of the Missouri River, of the buffalo skins shipped East from the plains and of the merchandise which passed to the Southwest by wagon over the Santa Fé trail.

Trade Associations.— After the Civil War there began to be formed in various parts of the country organizations of men engaged in the same line of trade. The wagon makers united; the window glass blowers got together; the hotel keepers began to consider their problems, etc. These various organizations, planned along trade lines, were local, state or national in scope. Among the important functions which they attempted were to standardize commercial usages, to exchange craft knowledge between the members and to control prices more or less directly. Some of these associations have done good work. The Society for Testing Materials (an organization of purchasing agents) has formulated many scientifically complete buyers' specifications. The Association of Railway Master Mechanics called attention, some years ago, to the dearth of skilled mechanics, and started the movement for apprenticeship courses and shop schools, which has accomplished so much in the hands of American railroads. Some of the trade associations have brought their members upon a more or less uniform plane of efficiency by prescribing a standard system of cost accounting suited to the industry. The majority of the associations formed along trade lines are of merchants. If an organization be of wholesalers it is very likely to plan trade-getting trips, to make special arrangements for buyers' weeks either by securing railway transportation of members at reduced rates or by giving free transportation to those who buy a specified amount of merchandise, and to organize a credit rating bureau. Organizations of retailers often make arrangement for style shows, draw up rules to prevent unprofitable advertising, operate a co-operative delivery system or establish a local credit bureau to identify delinquent debtors.

The Civic Basis of the Modern Movement.— The recent rapid growth of commercial associations in this country may be attributed to a revival of local civic life and to a new understanding of the basis of local business prosperity. The civic motive is about equal in importance with the economic one in the typical modern board of trade or chamber of commerce. There is coming to exist a more vivid civic consciousness. People now travel about so much that they get into the habit of appraising towns and cities as communities and of comparing them with their home town. Young businesses now look about more diligently for an advantageous location than was once the case, and less frequently grow up where the original idea happened to strike the founder. In other words, there is now a competition not only of individuals and firms but of neighborhoods for social, civic and economic prestige.

So long as the primitive communities had mud roads, oil lamps at the street corners, individual wells in the back yards; so long as locomotion was on foot or on horseback and there was plenty of space between the structures, the administration of local government was a routine affair. But when it became necessary to provide waterworks, grant franchises to a variety of public utility corporations, undertake such matters as street paving and the cleaning and sprinkling of streets, erect expensive bridges, maintain an efficient fire department, administer a complicated building ordinance, provide parks and technical schools and consider comprehensive schemes of city planning, it began to be realized by business men that the administration of a city was very much like that of a large business. And so there came a demand for «a business administration.»

In relation to this demand commercial associations have proved to be a convenient means for free and informal discussion. They have provided a centre where the progressive elements of the community could gather. They may be called the «planning department» of the city government, to borrow a term from 'Scientific Management.' They are training schools for a new type of citizenship. This function has been defined by Pres. H. A. Garfield of Williams College, in an address before the Cleveland Chamber of Commerce as follows: «If I may so express it, the centre of political gravity is gradually settling, and if it passes from our legislative bodies to the electorate there must be found a workable way of securing deliberation among the voters. If it should come about that the only place for free and effective deliberation is among the voters prior to election day, then, plainly, bodies like the Cleveland Chamber of Commerce will become normal centres for the consideration of public questions, and their influence will become increasingly important.»

The Economic Basis.— Membership committees of commercial associations have often to deal with the man who says, «How can I feel it in my business?» «What is there in it for me?» This brings up a critical economic point, the answer to which is, in brief, that business has been rapidly changing in character, and changing in such a way as to produce a more intimate local solidarity in economic matters. Business units have grown larger, margins of profit have grown smaller, more care is needed in buying, delays in local traffic are more hurtful, competition for labor is advancing to a higher plane, a wider and more even market is demanded, more science is available and more is needed. Of the local solidarity of business let us select one phase only,— namely, that which pertains to the equipment of a place as a market. How does a city become a good buying and selling centre? Merchandising involves measurement of quantities (systems of weights and measures), measurement of qualities (systems of grades), means of protecting merchandise while it is being held (warehouses and warehousing law) and an adequate assortment for the buyer. A sufficient assortment can only be ensured for out-of-town trade buyers by a systematic survey of the merchandise requirements of the tributary territory. A market also requires fair prices. The formula for fair prices is to bring to bear upon each transaction all possible elements of supply and demand. This means to bring past and future supply and demand to bear upon the present by providing adequate warehousing and cold storage. It means to bring to bear upon the market of one commodity the state of the market for other commodities which are either its raw materials or its manufactured derivatives; a thing which can be done by having the converting or manufacturing interests actively represented. It involves bringing the price of money to bear upon the price of goods by taking such steps as will interest the banks actively in commercial transactions and will make out of goods in storage an acceptable collateral for loans. It means, also, to bring different markets to bear promptly upon each other, by adequate market reports. A perfect market must have flexible credit for persons of ability and character. It must have efficient local trucking. It requires prompt railway transportation, which means not only the presence of railways but proper rates, frequent train service, a minimum of delay, convenient package car accommodations and a low percentage of loss and damage. A market is completed by an adequate information service of trade and general papers, and by a wide range of service industries to facilitate each item of trading transactions. From this bare enumeration it can be seen that a market is a complex thing. A large market is, indeed, about the most complex thing the mind of man has devised. Markets, well organized and of high efficiency, are still rare in the United States. Such a market does not merely happen; it does not grow like Topsy, nor emerge Phœnix-like from the fires of competitive hatred, nor blossom from the narrow stem of policy known as "every man minding his own business." It is the result of persevering joint effort. The economic activities of commercial associations can be scarcely more than suggested by means of a few illustrations. The Commercial Association of Bridgeport (Conn.) maintains a trade school. At Grand Rapids vocational guidance for boys over 15 years of age is provided. The Lynchburg (Va.) Chamber of Commerce promoted a new hotel, and finally a municipal public market. Atlanta (Ga.) manages a buyer's convention twice a year. The New Orleans Merchants' and Manufacturers' Bureau publishes a Spanish magazine, *Mercurio*, twice a month; the Saint Louis Manufacturers' and Exporters' Association also publishes a monthly journal in Spanish. The Galveston (Tex.) Commercial Association sent a party of merchants to Guatemala, Honduras, Costa Rica and Panama in 1913. The San Francisco Chamber of Commerce helped to found the Remedial Loan Association. The Spokane Chamber of Commerce has aided the North Pacific Fruit Distributors to organize. The Minneapolis Civic and Commercial Association took a census of farmers' opinions on good roads. The Houston (Tex.) Chamber of Commerce maintains a bureau which chronicles all freight delays in and out of the city. Hannibal (Mo.) has a Commercial Club which bought a large tract of land between the tracks of three railways and sold it to new plants. A number of associations, including those of Davenport, Iowa, Williamsport, Pa., Rockford, Ill., Jackson, Mich., and Boston, Mass., have loaned credit to new business concerns. It is now estimated that there are over 3,000 paid secretaries of commercial associations in this country. In 1912, President Taft, through Secretary Nagel of the Department of Commerce and Labor, invited the commercial organizations of the country to attend a national conference. The result was the formation of the Chamber of Commerce of the United States. This organization serves as a means of formulating the opinion of the business men of the country upon such economic questions as require a certain national co-ordination in action, or which rise into the domain of practical politics and require legislation or the attention of the administrative departments of government. The organ of this Chamber is *The Nation's Business*. See CHAMBERS OF COMMERCE.

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EDWARD D. JONES,
Professor of Commerce and Industry, University of Michigan.

COMMERCIAL BANKS AND DISCOUNT HOUSES. See BANKS AND BANKING — WORLD'S SYSTEMS (Article 3).

COMMERCIAL COLLEGES. See EDUCATION, COMMERCIAL.

COMMERCIAL COURTS. Tribunals distinct from the ordinary civil courts, in some countries are established in various commercial towns, or within certain districts, to settle disputes with regard to rights and obligations between persons engaged in trade, with the assistance of experienced merchants, by a brief process, according to equitable principles. The general introduction of tribunals of this sort began in the Middle Ages. The first was probably that established at Pisa, in the 11th century, and the basis of its decisions was the code of maritime laws of Pisa, confirmed by Pope Gregory VII in 1075. At first the commercial tribunals were not so much courts established by government as arbiters of disputes, freely chosen by the merchants and confirmed by the governments. Under the name of commercial consuls such committees of arbitration were appointed in all the great commercial cities of Europe; and in the course of time they really became tribunals of justice, and were, in part at least, administered by men of legal learning and experience. Pope Paul III confirmed the commercial consuls in Rome. Francis II in 1560 granted to the Parisian merchants particular arbiters for the adjustment of commercial disputes; and in 1563 was established the Parisian Court of Commerce, consisting of a judge and four consuls. The same thing soon followed in all the important commercial towns of France. In London Henry VII appointed particular commercial judges. The president of the commercial tribunal for the Hanse towns, established in 1447, bore the name of alderman. At Nuremberg, in 1621, a similar tribunal was instituted under the name of inspectors of the markets. The diets of the empire even called upon the German princes and commercial cities to follow this example, as the decrees of the empire in 1654 and 1668, and the decree of the Imperial Commission of 10 Oct. 1663, show. In many of these cities, as in Frankfort-on-the-Main, and in Leipzig, they were not so much independent authorities as delegates from the city councils. When commercial courts take cognizance particularly or solely of disputes relating to maritime affairs, they may be called courts of admiralty. Such a court was erected in Hamburg in 1623. The internal regulations of commercial courts commonly require that a part of the members, or at least the presidents, should be lawyers; the rest are for the most part experienced merchants, who are better adapted than regular judges to give counsel on commercial affairs, with which they are more acquainted, and which very often are not to be reduced to simple principles of law, but are to be decided according to commercial practice. Their jurisdiction commonly extends over all commercial disputes, matters of exchange, insurance, freight, bottomry, average, etc.; and further, over bankrupts, the hiring of shops and stores, clerks and apprentices; the debts of those who receive goods from merchants upon credit; and all natives and foreigners who traffic in the place and are found there, all shipowners, contractors for transporting goods, brokers, factors, etc., are obliged to submit to their decisions. They do as much as possible by oral investigation; and the intention of their institution is that they shall avoid the long and formal process of other courts. But when the difficulty and confusion of the matters in dispute occasion the necessity of an investigation in writing recourse is had thereto. The greater dispatch of these courts consists principally in this — that the defendant is orally summoned, once or several times, to appear before them at an early day, and if he fails to come, he can be brought by force. The complaint is then made orally, both parties are heard and sentence is given, if possible, immediately after. But as this can seldom be done, and most cases require reference to written documents, a day not far distant is appointed for the answer to the complaint and for the evidence on both sides, and the time is seldom or never prolonged. The remedies against a sentence must be sought from the same judges and are not easily obtained. Appeals are only allowed in very important cases, and upon the deposit of a large sum as a pledge that the final decision shall be obeyed without delay. The principal features of this process form the basis of most commercial codes. From the sentence of these tribunals appeal is made to the court of appeal within whose jurisdiction they happen to be. The other countries where these tribunals exist are Belgium, Spain, Portugal and Italy. See COMMERCIAL LAW; UNITED STATES COMMERCE COURT.

COMMERCIAL EDUCATION. See EDUCATION, COMMERCIAL.

COMMERCIAL FERTILIZER. See AGRICULTURAL CHEMISTRY; FERTILIZERS.

COMMERCIAL GEOGRAPHY. Commercial geography is the study of the exchanges of merchandise between the geographic sections of the world. Nature has greatly diversified the productions of the globe. Tropical growths for example differ in quality from those of the temperate zones and those of the mountain regions differ from those of the plains. Certain areas are especially fitted to produce foodstuffs, others manufacturing materials and in still others, the circumstances of population, transportation and supplies of raw material and fuel have developed great manufacturing industries. Commercial geography studies these conditions and notes the production of each area, and the interchanges present and possible. It is in fact a study of the geography of commerce.

The great improvement in facilities of transportation, communication and production which have characterized recent years, has stimulated the study of commercial geography. World international commerce has made its chief growth in the life time of the present generation. It was but $4,000,000,000 in 1850, $10,000,000,000 in 1870, $20,000,000,000 in 1900 and then jumped to $40,000,000,000 in 1913, the year preceding the great European War, which disarranged the commerce of the entire world and especially that of the great European countries, the world's largest importers and exporters. International trade quintupled in the half century, 1850 to 1900, and then doubled again in the 13 years 1900–13. The per capita of international commerce taking the entire world population, averaged in 1850 $4 per capita, in 1900 $13 per capita, and in 1913 $24 per capita.

This growth in international trade is, of course, very unevenly divided among the various countries and geographical sections of the world. The United States for example doubled its sales to Europe from 1900 to 1915, and doubled its purchases from that continent from 1900 to 1914, and this is true in a general way of its trade with Asia, Africa and South America. Equally striking is the fact that the United States' imports of tropical and subtropical products, including those from island possessions, grew from $335,000,000 in 1900 to $1,060,000,000 in 1916, having thus actually trebled in value in the short 16-year period, and this is a mere illustration of the growing demand of the temperate zones upon the tropical world. The international trade of the United States averaged $15 per capita in 1850, and $43 per capita in 1913. The international trade of all the countries forming the continent of Europe averaged $10 per capita in 1850, and $54 in 1913; that of the countries of the North American continent averaged $11 per capita in 1850, and $45 in 1913; that of the countries forming the continent of Asia 69 cents per capita in 1850, and $4.64 per capita in 1913. The contrast in commercial conditions in the different countries is illustrated by the fact that the commerce of China in 1916 averaged $1.63 per capita of its population, and that of Japan, which lies just alongside $11.20 per capita in the same year. Commercial geography studies these currents and cross-currents of trade, and seeks to determine the underlying causes of the contrasts and changes which these studies disclose.

Nature divided the land area of the globe into two great land masses stretching from the Arctic regions of the north to the Antarctic at the south. Then she «cross-sectioned» these by climatic belts, thus multiplying the exchangeable qualities of the products of their respective areas. America stretches in a continuous land mass from above the Arctic circle at the north to within a comparatively short distance of the Antarctic circle at the south. The continent of Eurasia, which we improperly divide into Europe and Asia, stretches in a continuous land mass from above the Arctic circle well into the tropics, and then by one southern extension, Africa, extends well into the south temperate zone, while its eastern limb, the Malayan Peninsula, with the co-operation of the chain of islands extending to Australia, stretches well into the south temperate zone. These two great masses, America on the one hand and Eurasia with its southern extensions on the other, are separated by two great oceans, the Atlantic and Pacific, thousands of miles in width, while climatic conditions cross-section each into a half dozen distinct belts, Arctic and Antarctic, north temperate and south temperate, tropical and sub-tropical.

Local conditions within the continents also affect production and producing possibilities. The great elevations which we call mountains and the tablelands adjacent to them lift their producing surfaces into temperatures radically different from those lying alongside on a lower level. Certain areas in tropical America for example, which lie a mile or two miles above the ocean level, enjoy a temperate zone climate although distinctly within the area designated as the tropics, while the adjacent areas lying but a few feet above the ocean level swelter in the fiercest tropical heat and their respective products vary in like proportion. On the other hand, certain land masses in the far interior of the continents are so distant from the ocean that they receive little if any rain, for, as is well known, all the water which the land receives is carried to it by the currents of air which have obtained their moisture from the evaporation of the ocean. Air which has been so charged in passing over the ocean begins to lose its moisture in the form of mists, rain or snow as it passes over the land and is forced upward, and so may lose practically all of its moisture before reaching the far interior of the continent, especially if it crosses high mountain ranges in its passage. As a result, we have the great desert areas in central and southwest Asia, North Africa, in the western part of the United States, the interior of Australia and certain sections of South America. Thus certain areas which lie within the tropics may have a temperate zone climate and certain other countries in the temperate zone or tropics may be absolutely unproductive by lack of moisture, which is plentiful in the same latitude a few hundred miles away.

Air currents and the currents of water which they have formed in the ocean have also a marked influence upon the productive conditions of the land, especially in the vicinity of the ocean. The «trade winds» so-called or air currents moving from the north and south toward the equator to fill the partial vacuum caused by the upward movement of the intensely heated air of that region blow more and more toward the west as they approach the equator, by reason of the fact that the surface of the earth at that point is traveling toward the east more rapidly than that part over which they passed in their movement from the north or south. This continuous flow of air toward the west during untold ages has set up currents of water in the ocean over which it passes, which also move toward the west in the vicinity of the equator, and when these currents of water come in contact with the land of the continent, they are forced to the north or south as circumstances may dictate, and carrying the great masses of water heated by their long passage through the tropics affect, to a greater or less degree, the climate of the land masses with which they come in contact. The great northern equatorial current which flows west across the Pacific Ocean from the Panama Canal to the Philippine Islands and the Asiatic coast is deflected northward along the eastern frontage of Asia and thence eastward to the northwest coast of North America, carrying some of the heat which it received in the tropics and materially modifying the climate of Japan and also that of the west coast of North America from Alaska to the southern part of the United States. Not only does it modify their climatic conditions but also gives to those areas much greater supplies of moisture than they would otherwise receive. The similar currents of air and water crossing the Atlantic Ocean just above the equator force the current of warm water through the Caribbean Sea and the Gulf of Mexico and thence northward along the east coast of the United States and across the north Atlantic forming the «Gulf Stream,» which carries warmth and moisture to northwest Europe. These currents of air and water from the vicinity of the equator affect climatic conditions and the productive powers of certain sections of the continents with which they come in contact and prove an important factor in their production and contribution to commerce.

By these various conditions, the temperate and tropical climates, the differences of elevation, and the modification of climate due to air and ocean currents, nature has greatly diversified the production of the earth's surface, while she has also by other processes distributed beneath the surface the minerals which man has learned to utilize in the manufacturing industries and in transportation of the various natural products now so freely interchanged the world over. Within the last century man has learned to apply the power of steam and that of the waterfall in the form of electricity to the transportation of the great natural products of these various sections of the globe, and also to utilize these powers in transforming the natural products into the form required to make them useful to man. One hundred years ago there was not in all the world a steamship on the ocean or a mile of railway or telegraph on land. Now steamships seek their landing place at the frontage of every continent, and 700,000 miles of railway bring the products of the interior to the water's edge or receive that which the steamship has brought across the ocean and distribute it to the interior. One hundred years ago the world had less than 800,000,000 people; now it has over 1,600,000,000 with vastly greater producing and consuming power per capita than those of a century ago, and their vastly greater commerce, $40,000,000,000 per annum at the present time against $4,500,000,000 a century ago. Thus geography and geographic conditions, coupled with the power of transportation between the geographic sections and areas produce commerce, and in studying commerce we must study the geographic conditions which bring it into existence.

The value of the merchandise forming international trade was in the latest normal year, 1913, about $20,000,000,000 or one-half of the usual statement of $40,000,000,000, which is obtained by counting the merchandise when exported from the various countries of the world and counting it again when it becomes an import in some other country. If we assume that the cost of transportation is about 5 per cent of the value of the merchandise transported we shall find that the world is paying $1,000,000,000 a year for mere carriage of the merchandise which it exchanges between the countries or continents, while the profits, legitimate or otherwise, of the millions of "middlemen" who handle the products in the passage from producer to the consumer thousands of miles from the place of production, are of course several times as much as the mere cost of transportation. Yet the people of the world ungrumblingly pay these billions of dollars every year for the sake of obtaining food, clothing, manufacturing material and manufactures accumulated from any and every part of the globe.

Trade between the climatic belts is very large irrespective of continental relationship. The tropical and sub-tropical areas of the world lie between the 30th parallel of north latitude which runs through New Orleans, Cairo and Shanghai and the 30th parallel of south latitude which falls a little north of Buenos Aires, Cape Town and Sydney, Australia. This tropical and sub-tropical belt around the world lying between the 30th parallel of north latitude and the 30th parallel of south latitude has one-half of the land area of the globe and half the world's population and it sells to the temperate zones at the north and south about $3,500,000,000 worth of its annual products.

Attention is especially called to the fact that only about one-half of the international trade of the world crosses the oceans. The other half is merely exchanges of merchandise between countries lying alongside each other or at least within the same continent. For example, the trade between the United States and the other countries of North America is, in normal years, one-third as much as that with all the other grand divisions of the world and the total interchanges of merchandise among the countries of North America are one-half as much as their trade with the other continents. In Europe, the interchanges among the countries forming that continent are actually greater than their trade with all the other grand divisions of the world. The aggregate of the imports of all the countries of Europe in 1913 was $14,000,000,000 and of this large total only $6,000,000,000 worth was drawn from other grand divisions, the remaining $8,000,000,000 being trade between the countries forming that continent; and of the $11,000,000,000 of exports of all the European countries, only $4,000,000,000 passed "overseas" or out of that grand division, Europe, the remainder being exchanges between the countries of Europe and therefore intra-continental. The share of the aggregate trade of the European countries which occurs with other continents is about 40 per cent, in the case of Asia about 50 per cent, North America 66 per cent, South America, Africa and Oceania 90 per cent. North America sells to the other grand divisions $2,250,000,000 worth of her products annually, and buys from the other continents $1,750,000,000 worth. South American exports to the other grand divisions are over $1,000,000,000 a year, and her purchases from them range about $750,000,000, and in exceptional years as much as $1,000,000,000. Asia sends $1,250,000,000 worth of merchandise to the other grand divisions, and takes from them $1,000,000,000 worth of their products. Slightly more than one-half of the entire international trade of the world is intercontinental or exchanges between the continents or grand divisions, the remainder is intra-continental or exchanges between the countries of the continent in which the merchandise originates.

What are the principal articles which form the exchanges between the great geographic and climatic divisions of the world? Food, manufacturing material and manufactures. Man must have food, he must have manufactures and therefore he must have manufacturing materials. The countries having a dense population produce less food than their own people require and must import the remainder. The countries having a sparse population produce more food than their own people require and can export the surplus. The country having the surplus is willing to sell its surplus to the country having the shortage, if the latter has something with which to pay for it, and it usually happens that the country which must buy food has a surplus of manufactures to sell, and as the new and less densely populated countries are not manufacturers, they are willing to take manufactures in exchange for their surplus food. If it is not convenient to make the exchange by the direct process, the purchasing country pays for the foodstuff in cash and the selling country takes the cash and buys its manufactures from a more convenient market. The manufacturing countries must also have manufacturing materials, and these they draw largely from the tropical and sub-tropical world, and as the tropical people are not manufacturers, they gladly accept manufactures in exchange for their natural products. They have also certain foodstuffs peculiar to the tropics, such as rice, sugar, coffee, cocoa, spices, fruits and nuts, which the temperate zone countries want and pay for in manufactures and in certain kinds of food which the tropics can not conveniently produce, especially flour and meat. In studying these natural exchanges and interchanges of commerce between climatic as well as continental sections, we therefore develop the study of commercial geography.

What have the respective geographic divisions to offer to the other parts of the world, and what do they respectively take in exchange? Europe has a population of 465,000,000 and an average of 120 persons per square mile; Asia, 80 per square mile; North America, 16 per square mile; Africa, 12 per square mile; South America, 7 per square mile, and Australia, 5 per square mile. Not only is the population of Europe much more dense than that of any other continent, but its people are much larger consumers per capita than those of certain other continents, notably Asia and Africa. So, it is quite apparent that Europe, densely populated as she is and having a population with a large consuming power, must draw large quantities of food from other parts of the world. That continent is also the largest manufacturer of the world, and with its dense population and closely occupied acres must draw much of its manufacturing materials from the other grand divisions. Europe as a whole produces in normal years about $45,000,000,000 worth of manufactures per annum out of a world total of about $80,000,000,000 of factory products, and supplies about $7,000,000,000 out of the $8,000,000,000 worth of manufactures entering international trade. For the food and manufacturing material which she requires, she draws chiefly upon North and South America, Australia and South Africa, and pays in manufactures and in the earnings of her ships and invested capital. North America, with a population of but 16 per square mile, has more of food and certain classes of manufacturing material than she requires; and although the United States is a large manufacturer and supplies nearly a half billion dollars worth of manufactures to her neighbors, the continent as a whole takes nearly a billion dollars worth of manufactures from Europe. South America, with a population of but seven per square mile, has a billion dollars worth of food and manufacturing material to spare annually, and Europe gladly takes most of it and pays for it with a half billion dollars worth of manufactures and the remainder in the services of her shipping and the earnings of her invested capital in that continent. This does not mean that all of the merchandise of South America goes to Europe, for parts of its wool and rubber and coffee go to North America, especially the United States. In Asia, with a population of 80 per square mile, the exportable surplus is small, and consists chiefly of silk, fibres, rubber, tea, coffee, tin, and certain other minerals, and for these she takes manufactures, chiefly from Europe, but in smaller quantities from the United States. In Africa and Oceania, the chief surplus is in tropical products and precious metals, though Australia and New Zealand supply large quantities of wool, meats and wheat, and all of Africa and Oceania take manufactures chiefly from Europe in exchange for the natural products above noted.

The tropical and sub-tropical world, while not a continent or grand division in the ordinary sense of the term, is in fact, a climatic division — a broad belt stretching around the world between the 30th parallel of north and south latitude already described. It supplies to the world about $3,500,000,000 worth of its products per annum, chiefly fibres, hides, rubber, coffee, tea, sugar and fruits, and takes manufactures in exchange, chiefly from Europe, but in limited quantities from the United States. Practically all of the surplus of the tropics is consumed in the temperate zone — chiefly in the United States and the manufacturing countries of Europe. The imports of tropical and sub-tropical products by the United States, including those from island possessions, increased from $335,000,000 in 1900 to over $1,000,000,000 in 1916.

While it is not practicable to indicate in the limits of a discussion of this character the exact commercial relation of the various countries of the world to the various geographical sections, the broad extent of distribution, especially by the great industrial countries, is illustrated by the fact that the United States draws certain of its imports, especially manufacturing materials, from more than 75 different geographical or political divisions of the globe — continents, islands or countries and colonies,— and sends certain of its products to more than 100 geographical and political divisions, extending to every part of the world.

Oscar P. Austin,
Statistician, National City Bank of New York.

COMMERCIAL LAW. This term is rather loosely applied to a body of laws of the greatest diversity in their origin and character, but which have this in common, that they have arisen out of the usages of merchants and that the legislation and judicial pronouncements thereon have taken note of and embodied these usages. There is no better way of indicating what Commercial Law, or the Law Merchant, is than to enumerate the chief topics which it comprises. These are: Agency, arbitration and award, auctioneers, bailments, bankruptcy, common carriers, composition with creditors, corporations, factors and brokers, guaranty and suretyship, insurance, monopolies and restraints of trade, negotiable instruments, partnerships, patents, sales, trade-marks and warehousemen. The classification of Commercial Law here given is in substantial accord with that adopted in the French 'Code de Commerce' and in the German 'Handelsrecht,' although the French codification is more inclusive and covers also the whole field of maritime law. The Law Merchant was regarded a distinct department of the common law and the word "trader" had once a technical meaning in English jurisprudence, being defined as "a person subject to the *lex mercatoria*." Inferentially therefore, persons not traders were not subject to this law, and in the provisions of the English and American bankruptcy acts, limiting their applicability to merchants and traders, one may see a survival of the distinctiveness above referred to. The Law Merchant, however, was not an outgrowth of the unaided Anglo-Saxon genius. Commercial law was well developed among the civilized nations, which lived and flourished in Mesopotamia and the Euphrates delta from a period prior to 4000 B.C., and the Jewish bankers of Babylon and Nineveh had learned to deal in foreign exchange, their primitive drafts being inscribed in cuneiform letters on clay tablets. The commercial usages of remote antiquity, assimilated and added to by the Romans, were preserved by Venice and other trading communities of the Mediterranean during the period of the Middle Ages. A goodly part of the Law Merchant was absorbed into the common law of England directly from the Roman *Corpus Juris*, while some of it came indirectly, through the admiralty courts. It goes without saying, however, that a nation so active in world-embracing trade as the English would develop a mass of mercantile usages and of interpretive and regulative law on a subject of such momentous interest to it. And the statement that the English-speaking peoples, including the people of the United States, have made larger contribution to the body of commercial law during the past century and a half than all the rest of the world has contributed in half a millennium, is an indisputable fact.

One of the most original contributions of the Anglo-Saxon genius to the instrumentalities of commerce is the "goldsmiths' note." This was a form of commercial paper issued by members of the Goldsmiths' Company of London against deposits of specie, the notes being payable to order of the depositor at a stated time and, when endorsed, they passed freely from hand to hand at face value. All that was needed was to make these promissory notes payable to bearer on demand, instead of to order and at a stated time, and to issue the same in the name of the guild instead of an individual member thereof, and the bank note was brought into being. This, indeed, was the genesis of banking currency. Out of the simple processes of transportation overland of freight and passengers, by wagons and stage coaches, arose the intricate and voluminous law of common carriers and its modern development, railroad law. The fundamental principles are few: A common carrier assumes absolute responsibility for the safe transportation and delivery of the goods and persons entrusted to his care; he is an insurer, and the fact that he has been guilty of no laches will not excuse him nor diminish his liability for losses. On the other hand, misrepresentation or concealment on the part of the shipper or owner of property carried, as to its character or value, constitute a fraud, vitiating the contract. The law gives the carrier a lien on any property entrusted to him to the amount of his claim to compensation for transporting and insuring the same while in transit; also any demurrage charges accruing through failure of the consignee promptly to accept the goods shipped and take them off the carrier's hands A common carrier may not discriminate between shippers in the rendering of services, nor in his charges for the same; he must receive and carry freight offered to the extent of his facilities, and may be compelled to increase facilities when the same are inadequate to the traffic. A bill of lading issued by a common carrier becomes an instrument of credit, acceptable as collateral and entitling the holder to the possession of the property billed on payment of transportation charges. The rights and obligations of warehousemen constitute important elements of commercial law. When a consignee unreasonably delays acceptance of goods shipped to him the common carrier is authorized to place them in storage, to be held subject to the carrier's lien and such further charges as may accrue in caring for and insuring the same. In many cases the warehouse, or some of the modern developments thereof, for example, cold storage and bonded warehouses, grain elevators and coal ports, are the intended destination of shipments *ab initio*. A warehouse receipt, unless it be specifically stipulated to the contrary on the face of the same, is a negotiable instrument.

The four main forms of commercial paper are the bill of exchange and its derivative the bank check, the promissory note and its derivative the bank note, the bill of lading and the warehouse receipt. Local usages have caused slight divergences in the law of negotiable instruments in the various States of the Union and other political subdivisions of the English-speaking world. Thanks to the efforts of the American Bar Association in propounding uniform State laws on this and related subjects, the inconveniences resulting from diversity are in the way of being remedied. From the latest *Report* of the proceedings of the Association (1917) it appears that the uniform Negotiable Instruments Act has become a law in 46 States (Georgia and Texas being the exceptions) as well as in the territories of Alaska and Hawaii, the District of Columbia and the Philippine Islands; the uniform Warehouse Receipts Act has been accepted by 39 States, and the Bills of Lading Act by 20 States.

The greatest addition made to commercial law at one stroke by judicial authority was the statement of the law of Bailments by Lord Holt in the celebrated case of Coggs *vs.* Bernard, which is reported in 2 Ld. Raymond, page 909. What a large block of law this is will appear from a consideration of the fact that carriers, depositories (including banks), factors and brokers, innkeepers, pledgees, warehousemen and all other persons who borrow, hire or receive goods and chattels for selling, transporting or safekeeping, or for performing some work on or with the same, are bailees with respect to the property thus put into or left in their possession. The commission merchant who receives a consignment of goods to sell is a bailee, so is a banker who receives a note for collection; so is one who hires a team by the hour, day or week and, also, the tradesman who makes "pants" for "gents" from their own cloth or makes furs for ladies "from their own skins." The word bailment is derived from the

Norman French, *bailler*, to deliver. Whatever is delivered by the owner to another person, in any of the ways or for any of the purposes above indicated, is bailed to him; and the law of Bailments comprises the rules and usages whereby the rights and duties of the parties in relation to the property and to each other are determined. Justice Holt, however, borrowed most of his principles, perhaps all of them, from the 'Institutes' of Justinian and the 'Corpus Juris Civilis.'

Under the subhead Arbitration and Award are embraced the rules of law and usages whereby merchants may obtain decisions of controversies between themselves without resort to the regular courts of law. An arbitrator is appointed by the parties on each side of the controversy and the two arbitrators select an umpire; whereupon the tribunal thus constituted proceeds with the hearing of evidence and the making of an award. The proceedings are informal and, while nobody can be compelled to arbitrate, when the parties have once submitted a case the submission is irrevocable, and the award made is enforcible just the same as is the judgment of a court of law. Some commercial exchanges, under special legislative authority, maintain courts of arbitration, presided over by permanent judges, who act either alone or as umpires in association with arbitrators appointed by the parties. Latterly efforts have been made to extend this method of adjudicating disputes among merchants internationally, and notable progress has been made toward an agreement between the Chamber of Commerce of the United States and the corresponding Argentine body at Buenos Aires. Composition with creditors is a common law method for the discharge of an insolvent debtor from his obligations. Usually the composition is preceded by an assignment of the debtor's property for the benefit of all of his creditors, with the object of preventing any creditor from obtaining a preference. All of the creditors must agree to the composition and the terms of settlement must be equal for all. If a single creditor, no matter how small his claim, refuses to sign the composition deed, or if by secret arrangement any discrimination whatsoever be made in favor of one or more creditors, the settlement is a nullity. To all intents and purposes compositions with creditors have been superseded by proceedings in bankruptcy (q.v.). Originally the law terms guaranty and warranty were of identical meaning. In time, however, «warranty» became employed exclusively as a term of assurance of the title, quality or quantity of a thing sold. Guaranty is an undertaking on the part of the guarantor to pay the debt or perform the obligation of another in the event of the latter making default. A guaranty, generally speaking, is not negotiable; nor is it transferable in such a way as to enable anybody except the party with whom the contract was originally made to maintain an action thereon. Regarding marine insurance as a subdivision of maritime law, the form of indemnity contract with which commercial law is chiefly concerned is fire insurance. This kind of insurance is sometimes made to indemnify against loss by fire of ships in port; more often this form of insurance is made to cover warehouses and mercantile property therein contained, or goods and chattels in stores and factories. The general principles of the law of contracts will answer most questions raised by fire insurance policies; but the analogies with marine insurance are many. A debtor, however, may insure his life for the benefit of his creditor. The law of agency rests on two fundamental principles: (1) The agent is a mere instrument, though a living and intelligent one; for, whether a man signs his name with a pen which he takes from the table, or by another man whom he requests or authorizes to sign for him, in either case the act is that of the principal; (2) as between the principal and a third party, the former is responsible for all the acts of the agent, if there was colorable reason for the belief of the third party that he was dealing with a principal or that the agent was duly authorized. Like the law of agency, the law of partnership and its modern outgrowths, the law of joint-stock associations and of corporations, are subjects too large for cursory treatment under the general head of commercial law. The modern law against monopolies and restraints of trade, though the same has become the subject of voluminous statutory regulations and judicial opinions, is a mere amplification of a few principles of the common law on the subject. The epochal opinion of Chief Justice White in the Standard Oil case was little more than a restatement of old and familiar legal maxims embodying commercial usages. The codification of the law of sales has been accomplished in England, but the Sales Act submitted to the National Conferences of the Commissioners on Uniform State Laws has, thus far, been ratified by only 18 States and Alaska Territory. The two controlling principles of the law of sales are: (1) That, where goods are sold by sample or according to description, there is an implied warranty that they correspond to the sample or description; (2) that in the absence of an express warranty the purchaser, having an opportunity to examine the goods, must be on his guard against defects.

In default of codification the Commercial Law as it exists in the United States must be sought under the titles of the subjects which it comprises. Even such a codification would be of little service to layman inexpert in the interpretation and construction of statutes. The hodge-podges published under such names as 'Business Laws' or 'Every Man his own Lawyer' are to be shunned as traps for the unwary. The saying that «a man who is his own lawyer has a fool for a client» is as true as ever. There are no short cuts to a knowledge of the law any more than there are to the knowledge of other sciences. Consult Parsons' 'On Contracts' (9th ed., 1909) or any other of the standard textbooks used by law students, which fairly cover the ground. An excellent English work is Smith, John William, 'Mercantile Law' (11th ed., London 1905).

STEPHEN PFEIL.

COMMERCIAL LIFE INSURANCE. The primary purpose of life insurance is the protection of domestic relations. Obviously the proceeds of a life policy may serve at the same time to protect the insured's business interests when these are unexpectedly deprived of his directing hand and brain; but in recent years the agency of life insurance has been more directly and broadly applied to commercial affairs. After providing suitably for the family by means of a policy made in their favor, an individual may provide guaranty for business credit beyond his tangible assets by means of a policy made payable to his estate; and copartners may provide against untoward disturbance of their joint capital and prospects by policies made in favor of the firm or of each other; while corporations may provide against loss through the untimely removal of experienced executive heads or of peculiar and essential talent by means of policies covering the lives of those on whom the company's prospects for the time depend. Owing to the immense development to-day of combined commercial interests and the consequent weight of responsibility resting on single lives, insurance running often to hundreds of thousands of dollars, and in some cases to millions, is now placed to safeguard the financial stability of corporate concerns or to indemnify them in case of the loss of service difficult or impossible to replace. The simpler business organization of a generation past called not often for such protection, but such is the peculiar genius, talent or experience involved today in many large enterprises that untoward removals in their personnel would cause serious if not irretrievable loss. Thus, on the one hand, commercial life insurance serves to aid in the development and stability of business by affording an additional guaranty for credit or for emergency loans, and on the other hand conserves business interests that might otherwise suffer from the loss of lives essential to their prosperity. The prediction is ventured by an authority that the life insurance policy will soon be an integral part of every considerable business arrangement. All the common forms of life policy are in use for commercial purposes, and the premium is considered an expense charge.

COMMERCIAL PAPER. A general name for checks, drafts, notes, bills of lading, bills of exchange, warehouse receipts, treasury warrants, orders for delivery of goods, certificates of stocks and bonds and sometimes loosely applied also to contracts and agreements. The term is intended to cover all that class of documents which are used commercially in place of money, and is therefore sometimes restricted to checks, drafts and notes.

Checks.— A check is an order on a bank, trust company or broker connected with a clearing house, calling for the payment of a specified amount of cash, from the funds of the maker on deposit, made to the order of some one named, or to "Cash" or "Bearer." It is frequently numbered, and written on a printed form blank, which may be on paper with a printed tint to prevent erasures. It is usually filled in with ink, and often the figures are also punched out of the paper or embossed so as to prevent alteration. It is good, however, if written in lead pencil, on any sort of paper. Its payment depends on the bank official's recognition of the signature, or his knowledge of and confidence in the party presenting the check for payment. Business houses seldom cash their checks, but deposit them as received, and draw their own checks for the payment of their bills. The check after payment is punched or canceled and eventually returned to the signer or maker, who thus secures a receipt which is positive evidence of the payment of the sum named, as the party receiving a check has to put his name on the back before it will be cashed or credited to his account. A check is payable whether dated or not, but if dated ahead is not payable until the date stated. To give a check dated ahead is sometimes necessary for a conditional transaction, but it is an improper proceeding unless the cash is in the bank. When a bank is asked to certify a check, it will do so, if the funds are there to the credit of the maker, and it then becomes primarily liable, and the sum no longer remains to the credit of the signer of the check. Checks are usually printed in quantities in blank and bound in books with stubs, on which may be kept a record of the transactions. Banks have to pay all the checks they handle or make themselves liable for them; but they turn the checks over daily to a clearing house, which figures out the balances due to or receivable from each bank, and settles only the balances in cash. This system relieves each bank of the immense detail of collecting each individual check.

Drafts.— A draft is very similar in form to a check, but it is an order from one bank to another bank to pay a sum stated to the party in whose favor it is made. A small merchant in a small town, who is not known, desiring to send a payment to a large city house and secure immediate shipment of the goods he orders, gets from his local bank a draft on a city bank, and uses this instead of his own check. The city merchant receiving such draft can cash it at once, knows that it is good, and has no hesitation in shipping the goods. A sight draft is an order drawn by a party to whom money is due, for the payment of money by another party at a bank named, and sent through the bank for collection. If the party to whom it is addressed through the bank pays it, it is said to be accepted.

Bills of Lading, etc.— A bill of lading or a warehouse receipt is a receipt from a transportation company or warehouse showing that the goods specified have been delivered to them. Such bills are often commercially important, being frequently used as a basis for borrowing money. Wholesale merchants sometimes handle goods vastly in excess of their capital, but through borrowing on such receipts secure funds for transacting a large business.

Notes.— A promissory note is a promise to pay a specified sum on demand or at a future date. (See PROMISSORY NOTE). The signer of a note, draft or check is the drawer or maker. The one to whom payment is to be made is the payee. One who signs on the back is an endorser, and he thus guarantees the payment. To hold an endorser liable for the non-payment of a check or note, he must receive prompt notice. There may be several endorsers. A release by the holder of a note to one endorser releases all other endorsers.

Money Orders, etc.— In the United States these are issued at nearly all post-offices by the postmaster for amounts up to $100, on payment of a fee of 3 cents for $2.50 or less and up to 30 cents. They are payable at the post-office named or can be banked for collection for $100.

Express orders are also issued by express companies for moderate amounts and are payable at any office of the company, or can be banked like ordinary checks.

Certificates of stocks and bonds that have recognized value may be deposited with banks as collateral security for loans. See Negotiable Paper; Banks and Banking (Article 17).

COMMERCIAL POTASH. See Potash, Commercial.

COMMERCIAL REVOLUTION AND DEMOCRACY. See Democracy, History of.

COMMERCIAL TERMS. The following list is practically a short dictionary of the terms used in commercial or business life. As it is manifestly impossible to include all the terms applied in this relation, care has been taken as far as possible to omit those that may be ordinarily regarded as self-explanatory. Some of the more important terms are defined more fully under their respective headings.

Abandonment.— Used in the customs when an importer abandons his property to avoid paying duties upon it.

Abatement.— A creditor's voluntary reduction of his claim.

Abbrochment.— The act of controlling the market by monopolizing goods.

Acceptance.— An engagement to meet a draft or bill of exchange. To make it legally correct the person against whom the bill is drawn must write his name across its face. Sometimes the word "Accepted" written above the name, is also insisted upon. An acceptance is "clean" when no qualification is affixed and "qualified" when some modification accompanies the signature.

Acceptor Supra Protest.— A person who, while not a party to a bill of exchange which has been protested, engages to pay it if the drawee does not.

Accessory Contract.— An engagement made to secure the observance of a prior contract; sometimes by the same parties; sometimes by others, as in the case of suretyship, etc.,

Accessory Obligation.— An obligation that is subordinate to another obligation, as when a mortgage is made to secure the payment of a bond.

Accommodation.— A term usually used to denote pecuniary aid in time of emergency.

Accommodation Bill.— A note, or bill of exchange, not founded upon a prior debt, but endorsed by one or more responsible parties that others may obtain credit on it.

Account.— (*a*) A record of money transactions, as with a bank; (*b*) in business, the statement of debits and credits, with balance on hand, or due; (*c*) on the stock-exchange, a transaction to be settled on the regular settling-day.

Account Current.— A detailed account of business dealings still continuing between specified parties. Sometimes called an open account.

Account Sales.— An account rendered by a broker or commission merchant to his principal, specifying the goods sold, prices obtained and the net result after the deduction of commissions, expenses, etc.

Accountable Receipt.— The form of receipt given when the money or goods received are to be accounted for.

Accrued Dividend.— The proportion of dividend not yet due, computed to a date prior to the time set for payment, or the elapsed time since the last previous payment.

Accrued Interest.— The amount of interest not yet due computed to a date prior to the date of payment.

Accumulated Dividend or Interest.— Dividend or interest past due and unpaid.

Acquittance.— An acknowledgment in writing that a debt has been paid.

Active.— A term used to denote brisk, or lively trading, as: an active market.

Adulteration.— The act of debasing goods by admixture with other substances. When performed to meet the tastes and demands of the public it is called "conventional" adulteration; when done with intent to deceive it is "fraudulent" adulteration; when through carelessness it is known as "accidental" adulteration.

Ad Valorem.— According to value. Usually applied to duties levied by the customs.

Advantage.—Another term for usury; (*b*) the thirteenth article added to make what is commonly known as the baker's dozen.

Advices.— A notification respecting mercantile transactions especially in the dispatching of goods.

Affreightment.— The act of hiring a ship in which to transport goods.

Against.— Used in commerce in reference to a balance, as when an exporter draws against the merchandise he has shipped.

All-Around Price.— A price which includes all charges and costs.

Allocation.— Allotment, as of stock or bonds to bidders.

Allonge.— Sometimes called a rider. A paper attached to a note, or bill of exchange to receive endorsements for which there may be no room on the back of the bill.

Allotment.— The act of dividing a ship's cargo into separate portions that they may be assigned by lot to different purchasers.

Allotment Certificate.— The memorandum issued to an applicant for stock, showing the number of shares alloted, etc., as well as the dates on which the payments are to be made.

Alongside.— Delivery of goods at the side of the vessel on which they are to be loaded.

Amortization.— A term used chiefly to denote the extinction of a debt by a sinking fund.

Appraisement.— Chiefly used to denote the value placed upon special articles by disinterested person.

Appreciation.— An increase in the value of property — as of real estate.

Arbitrage.— A branch of the stock exchange business, its transactions being based upon the temporary difference in the price of securities in two markets, the purchases being made in the cheaper, the sales simultaneously in the dearer market. As applied to exchange it is called arbitration.

Articles of Association.— The document containing the internal regulations of an incorporated company with all the laws by which its affairs are conducted.

Assessment.— Used on the stock exchange to denote the sum charged against stockholders to pay debts of a corporation.

Assets.— The entire property, both real and personal, that may be devoted to paying the debts of the person, estate or corporation.

Assignment.— The transfer of title or interest in property; chiefly used when the transfer is made for the benefit of creditors. The term is applied both to the action and to the document making said transfer.

Attachment.— A legal process directing that the person or estate of a person be taken and held by an officer of the court to secure a debt, or demand, etc.

Audit.— Official verification of accounts and claims made to prevent fraud on the part of the person keeping the books.

Average.— (1) As applied to a series of accounts, the date at which the whole sum due may be regarded as payable; (2) The charges, over and above freight charges, paid to the master of a ship for his personal attention to the care of the goods. The small charges paid by the master for pilotage, towage, etc., are specified as "petty average."

Average Adjuster.— When a loss is to be divided between several interested parties the expert accountant who ascertains and states the sum to be paid by each person is called the average-adjuster, or average-stater.

Back Spread.— An arbitrage in which the price in either market is less than the price in the other plus the transportation charges.

Balance.— The sum required to equalize the debit and credit sides of an account. If added to the debit side it is a credit balance, and vice-versa.

Balance of Trade.— The difference shown between the total value of a country's annual exports and imports.

Balance Sheet.— A condensed statement showing the financial condition of a business.

Bank Bill or Bank Draft.— A bill or note drawn by one bank upon another and payable according to specifications.

Bank Credit.— An arrangement by which, upon the giving of proper security, a person is permitted to draw to a specified extent upon the bank's funds.

Bank Note.— A promissory note by which the bank of issue agrees to pay its face value to bearer on demand. In the United States and Canada, where these notes are issued only by banks authorized by law, such paper passes as currency. .

Bank Rate.— The rate of discount established by the banks. The term is used generally in reference to the rate established in foreign countries by the government banks.

Bankrupt.— A person who, having become insolvent, or unable to pay his debts in full, is adjudged a bankrupt by the court, either upon his own application or on that of his creditors.

Bar.— Commercially a bar is an ingot, or lump of gold or silver, run in a mold, but still unwrought.

Bear.— In the stock exchange the term denotes a person who sells stocks or shares that he does not possess for future delivery in the expectation that he will be able to buy them, in the meantime, at a lower price.

Bear Market.— A condition of the stock market in which prices are tending downward.

Bill.— A written statement of goods delivered or services rendered with the amount of money charged for the same.

Bill-book.— A book in which the merchant keeps the detailed record of promissory notes, bills of exchange, etc.

Bill of Adventure.— A document by which a master or ship-owner shows that the goods shipped on a vessel are at the venture of another person, he being responsible only for their delivery.

Bill or Letter of Credit.— A letter requesting that credit in goods or money be given to the bearer.

Bill of Entry.— A written statement of goods entered at the custom-house.

Bill of Exchange.— A written order to pay on demand, or at some specified time, a certain sum of money to a specified person, or his order; usually in foreign commercial dealings.

Bill of Health.— An official certificate showing the condition of a ship's company at the time of her clearing port. Such bills are termed "clean," "suspected," or "foul," according to conditions prevailing, both on the ship and at the place from which she cleared.

Bill of Lading.— A receipt for goods delivered to a common carrier for transportation. Usually applied to goods delivered to a railroad or on board ship.

Bill of Sale.— A contract by which an absolute or conditional transfer of goods is made; often given as a security for debt.

Bill of Sight.— A custom-house entry which permits the importer to inspect goods before they are officially accepted.

Bill of Stores.— A license granted by customs officials by which merchant vessels are permitted to carry stores and provisions for their voyage free of duty.

Bill of Sufferance.— A license authorizing coasting vessels to trade from port to port without the payment of customs duties. Under such license all goods must be loaded and landed at sufferance wharfs.

Bills Payable and Receivable.— Bill of exchange, promissory note or other commercial paper. The person who is to pay it terms it a "bill payable," the person who is to be paid holds it as a "bill receivable."

Blank Endorsement.— An endorsement without direction as to whom the funds are to be paid: the bearer then becomes the owner.

Blind Pool.— A fund contributed by several persons and placed in the hands of one for secret investment.

Blotter.— Called also the day-book: the running record of a business.

Boarding-officer.— A custom-house official whose duty it is to board ships upon their arrival, to examine papers and prevent smuggling.

Bond.— (*a*) An instrument by which the maker binds himself to perform a specified act; (*b*) a surety; (*c*) goods or merchandise left in charge of custom-house or excise officers.

Bonded Debt.— An obligation contracted under and secured by a bond.

Bonded Warehouse.— Often called "public" or "bonded stores." A building in which goods or merchandise is stored pending the payment of customs duties or excise tax.

Bonus.— (*a*) A premium for a loan; (*b*) an extra-dividend or allowance paid out of accumulated profits; (*c*) an honorarium, or extra sum paid voluntarily as a reward for successful efforts or as a stimulus to extra exertions.

Book-account.— In double-entry bookkeeping, an account showing transactions in some particular commodity, without reference to the individual with whom they may have been effected.

Book Value.— The value of stock as based on the records of the company as distinguished from the market price.

Boothage.— The sum charged for the right to erect booths at fairs or in market places.

Bottomry.— The mortgage of a vessel to secure a loan.

Bought and Sold Notes.— Contracts issued between brokers at the conclusion of arrangements for sales or purchases. Also called "Contract notes."

Bounty.— A premium or reward offered by a government to encourage some particular branch of industry.

Bourse.— The name applied to the stock exchanges, or money markets of Continental Europe.

Broker.— The middleman who negotiates the purchase or sale of stocks, commodities, etc., for others, accepting a commission, called "brokerage," in return for his efforts. There are many classes of brokers, the following being examples: Bill-brokers, insurance brokers, cotton brokers, stock exchange brokers, curb brokers, ship brokers, etc.

Broker's Note.— A voucher containing the particulars of a transaction delivered by a broker to his principal.

Bucket Shop.— While nominally established for the conduct of a stock exchange business, the fact that there are neither transfers nor deliveries of the stocks or commodities dealt in has led the courts to determine that its transactions are nothing more than gambling wagers.

Bull.— On the stock exchange, one who purchases stock for future delivery, expecting to sell at a higher price before the time of settlement.

Bullion.— Chiefly used to denote uncoined gold and silver in bars and other forms. Bullion value is the market value of the metal in coins as metal.

Buyer Four (or Ten, Twenty, Thirty or Sixty) — refers to the number of days during which a buyer of stock may elect to demand its delivery upon 24 hours notice. The period may not be less than 4 days nor more than 60 (New York Stock Exchange). Buyer the Year is permitted on some exchanges.

By-bidder.— A person employed to make fictitious bids upon goods sold at auction, to secure higher prices for the owner.

Call.— (*a*) A privilege secured by contract and a consideration, of claiming and receiving either a certain number of shares of some particular stock at a stated price and within a given period, or the difference in value between the date of the demand and the date of the contract. (*b*) A notice of withdrawal of bonds, upon receipt of which holders must present them and receive payment of the principal and whatever interest may be due. (*c*) An assessment upon stockholders to pay instalments or losses.

Call Loan, or Call Money.— Money loaned on condition that it may be recalled at any time.

Called Bond.— A bond called in by the maker for the purpose of payment. A bond ceases to earn interest when it is called.

Camarage.— The rental paid for a storage house.

Cancel.— A bill, or bond becomes void when the word "Canceled" has been written across it, or the signatures punched out or cut.

Carrier.— One who conveys goods or persons for hire. A "common" carrier carries as a business; a "private" or "special" carrier, by special agreement.

Carrying Charges.— Interest paid by purchasers of stocks on margin, on the difference between the market price of the stock bought and the amount of margin deposited to hold ownership in it.

Cash.— A term ordinarily applied to coin, and other currency, although readily negotiable securities are sometimes included. The term "hard cash" is also frequently applied to money actually in hand.

Cash Account.— An account of money transactions: receipts, payments and balance on hand; (*b*) a term used in banking to denote the credit given to depositors on receipt of a properly secured bond for the repayment of the amount advanced with interest.

Certificate of Deposit.— A negotiable receipt issued by a bank upon deposit of money. The legal possession of the certificate carries with it the ownership of the money deposited.

Charge.— (*a*) To fix as a price; (*b*) to set down at a price; (*c*) to enter on the debit account.

Charges Forward.— The accumulated expenses of goods in transit to be paid on delivery. They may include the purchase price also.

Charter.— (*a*) A document given in evidence of a government grant conferring privileges on the fulfilment of specified conditions; (*b*) the hiring of a ship by special contract.

Charter Party.— The written agreement under which a vessel is leased.

Check.— To all intents a check is practically a bill of exchange, payable on demand, being a written order for money previously deposited with a banker. When a check has been endorsed by the payee, and paid to a third party it loses its claim against the endorser if not deposited or mailed for collection by the day after its receipt by the holder.

Chop.— An exporter's brand, representing a certain definite quality of goods.

C.I.F.— Cost, insurance and freight (q.v.).

Circular Note.— A letter of credit issued on foreign firms by bankers to travelers.

Circulating Medium.— The recognized means of making payments.

Clear Day.— A business day intervening between the day a transaction is entered upon and the day it is concluded.

Clearance.— An official document certifying that a vessel leaving for a foreign country has complied with the laws of the port sailed from.

Clearing.— A term used in several branches of trade, and usually to denote different actions. A vessel is "cleared" when it has furnished all particulars about its crew and cargo when about to leave port. In importations goods are "cleared" when all duties and dues have been paid. In banking, "clearing" is a term applied to a plan by which checks and bills are exchanged daily.

Clearing House.— An institution where local banks meet daily to settle their mutual claims. Its certificates of deposit are negotiable only between members of the association.

Collateral Security.— Any property given to secure the performance of a contract and that is to be surrendered upon the performance of the latter.

Commercial Paper.— Drafts, bills of exchange and other negotiable paper given in the course of business.

Commutative Contract.— A contract in which each of the parties interested gives and receives an equivalent.

Composition.— The sum, or rate agreed upon in compounding with creditors. When a contract is signed by which the creditors agree not to molest their debtor the document is termed a "composition deed."

Compound Interest.— Interest paid not only on the principal but on the interest that accumulates thereon, the latter being added to the original amount.

Concession.— A grant or privilege made by governments to individuals to encourage them in carrying out undertakings that promise to be mutually beneficial.

Confirmation.— A document remedying a defect or supplying an omission in a contract.

Condition of Sale.— A written statement of the particular terms under which property may be sold at auction.

Consignment.— Goods sent for sale or delivery according to agreement. The sender is called the "Consignor;" the recipient, the "Consignee."

Content.— A term used in the customs to denote the paper given by the master of a vessel before she clears outward. It details the vessel's destination, describes goods shipped, etc.

Contraband.— Goods exported or imported contrary to the laws of the country concerned.

Cooked.— A term used to stigmatize a report or accounting which has been intentionally made deceptive.

Corner.— Commercially the term is used to denote the fact that some person or clique has purchased so largely of a certain stock or commodity for immediate and future delivery that nearly the whole available supply had been monopolized.

Corporation.— A company of individuals whose acts are recognized by law as those of a single person. A corporation which fills its own vacancies is known as a "close" corporation.

Cost, Insurance and Freight.— Items of expense sometimes grouped to make the purchase price of goods — said to be sold c.i.f. In such case the carrier becomes the agent of the buyer, and delivery to the carrier is construed delivery to the buyer.

Coupon.— A warrant for the payment of interest or dividends that may be detached from bonds and presented for collection when such payments fall due. The expression "coupon off" means that the current interest has already been collected; "coupon on," that it is still to be collected.

Covering Shorts.— The term "to cover shorts" is used in the stock exchange to denote the fact that some person has bought in such stocks as he had previously sold short to enable him to meet his engagements or to protect himself against loss.

Credit.— A term applied when goods are sold upon the understanding that they are to be paid for at a future date. The time given for such payment denotes whether the accommodation shall be known as a "long" or a "short" credit.

Currency.— The legal coinage, or any form of money which is current as a medium of exchange.

Customs Duties.— The tax, or duty imposed by law upon the exportation or importation of merchandise.

Cutting a Melon.— A distribution of extra dividends of money or stock to shareholders in an enterprise.

Days of Grace.— The number of days which may expire after payment is due before said payment may be demanded. In the United States and Canada three days of grace are usually allowed, except on "demand" or "sight" paper although some States, like New York, have abolished all grace in the payment of obligations.

Dead-pledge.— Lands or goods pawned, or pledged.

Debenture.— (*a*) A deed given by a corporation as an evidence of debt which may be negotiated like any other investment paper; (*b*) in the customs the term is used to denote a certificate of drawback indicating that the holder is entitled to a refunding from the government on the re-exportation of goods upon which the duties have been paid.

Debit.— That which is entered upon an account as a debt.

Deferred Bonds and Shares.— Bonds on which the payment of interest does not begin till some future date. Holders of "Deferred shares" do not participate in the profits until the expiration of a specified time.

Del Credere.— An additional commission paid to a factor, or agent when he binds himself to be responsible for the transaction of business, but also to guarantee the solvency of those with whom he contracts.

Delegation.— A term used in banking to denote a non-negotiable letter employed by bankers in transferring a debt; also, a third person substituted for the original debtor in a transaction.

Demurrage.— A charge made as compensation for the detention of a freighter in loading or unloading; also applied to railroad cars so detained.

Deposit.— (*a*) A sum of money placed with bankers for credit under agreed conditions; (*b*) partial payment on goods before delivery as a security for the order.

Depreciated Money.— Money which will not exchange for its face value in gold coin.

Differential.— A transportation rate made lower for a less advantageous route, in order to equalize attractions for business.

Disagio.— The percentage retained by a banking house for exchanging foreign money.

Discount.— Allowance made on bills paid before they are due; also interest collected in advance, as in discounting notes. The term "At a discount" implies that an investment is below par. "Discount day" in banking is the day set apart for the discounting of bills or notes.

Dishonor.— When acceptance of a draft is refused; or when an acceptor fails to pay a bill when due it is said to be "dishonored."

Dividend.— (*a*) An individual share of profit due upon an investment. (*b*) The payment made by a bankrupt to creditors in adjusting the difference between his assets and liabilities.

Document Bill.— A bill of exchange accompanied by such security as a bill of lading, an insurance policy, etc., given in return for an advance in money.

Dollar Exchange.— Exchange drawn in dollars and cents to be paid in a foreign country; or drafts drawn in a foreign country to be paid in dollars in America.

Domiciled.— A term applied to a note or draft made payable at a designated place.

Draft.— A term used in many connections, but usually as a bill of exchange. A draft requires acceptance by the person on whom it is drawn. The drawer assumes no liability for the draft when making it; as he does when making a check.

Drawback.— Duty paid on imported goods refunded because of re-exportation.

Due Bill.— A cashier's check issued by a bank in lieu of the usual form of certification, the original check being retained by the bank holding the account.

E.& O.E.— An abbreviation of "errors and omissions excepted." By the affixing of these letters to an account, the right to correct it is reserved.

Earnest Money.— Money paid to bind a bargain.

Embargo.— An official seizure of ship or merchandise to prevent its removal from port.

Ex.— As used in combinations ex-dividend or ex-interest means not including the accrued interest or dividend.

Exchange.— (*a*) To part with in return for an equivalent; (*b*) a place where merchants, brokers, etc., meet daily to transact business.

Exchanges.— The checks, drafts, etc., on any bank presented for payment through the clearing house.

Excise.— The tax imposed upon certain articles of home production. Also called the "Internal Revenue tax."

Extended.— Applied to a bond which is continued after maturity for a certain period.

Factor.— A selling agent to whom is given possession of goods to be sold — in distinction from a broker who does not have the goods.

Fat Loan.— A loan secured by an overplus of collateral.

Fiduciary Capacity.— A relation of trust and confidence. Thus a "fiduciary loan" denotes a loan granted without other security than confidence in the borrower's honor.

Fiscal Year.— Any 12 consecutive months covering financial operations, as distinguished from the calendar year. The fiscal year of the United States extends from 1 July to the following 30 June.

Five Ports.— An exporter's term referring to Boston, New York, Philadelphia, Baltimore and New Orleans.

Flat.— Without interest.

Floating Capital.— Money tied up temporarily in raw material and partly manufactured goods, wages, etc.;— as distinguished from *fixed* capital, invested in buildings and machinery.

Floating Debt.— An unfunded debt.

Flotsam.— Goods from a wreck that are found floating.

F.O.B.— Free on board:— all expenses paid to and including the loading of freight on cars or vessel.

Force Majeure.— Circumstances that are beyond human control.

Foreclosure.— To deprive a mortgagor of his right to redeem the property mortgaged.

Forwarding Note.— A descriptive note sent by the consignor with goods conveyed by carrier.

Four Ports.— The four principal ports on the Atlantic coast — Boston, New York, Philadelphia and Baltimore.

Fourth Week.— In railroad accounts, all the days of a month remaining after the 21st, numbering 9 days in months of 30 days, and 10 days in months of 31 days.

Fraught Money.— Money paid for the transportation of goods.

Free Alongside.— The purchase price for goods sold under this condition includes their delivery alongside of a designated vessel; at which juncture the seller's responsibility ceases, and the buyer's begins.

Free Overside.— The purchase price of goods thus sold includes delivery out of the hold of a vessel upon a lighter, or upon a dock. When so delivered, the seller's responsibility ceases.

Funds.— The accumulation of money, or its equivalent, devoted to, or available for the maintenance of some business or institution, or for some other specific purpose.

Goodwill.— The value supposed to attach to an established business connection.

Gross.— (*a*) Weight and amount without deduction for any purpose; (*b*) 12 dozen, or 144 articles.

Guarantee.— An engagement to fulfil another person's obligations provided he fail to do so.

Hedging.— Guarding against loss by purchasing against a previous sale or selling against a previous purchase, not necessarily in the same security.

Honor.— To meet a claim, or obligation at the time when it is due.

Hypothecation.— (*a*) The act of pledging, by delivery or otherwise, stocks, bonds, etc., as security for obligations; (*b*) the mortgage of a vessel or her cargo.

Impost.— A government tax or duty laid on goods imported.

Indenture.— A sealed agreement between two or more parties.

Insolvent.— A person whose assets are insufficient to enable him to meet his liabilities.

Interest.— The sum paid for the use of money or the profit derived from the employment of capital.

Investment.— A sum of money expended with the hope of making profit. As applied to securities, it signifies those bought outright and not on margin.

Invoice.— An account sent to the buyer or consignee of goods, in which the seller gives details respecting quantity and price.

Jetsam.— Part of a ship's cargo that sinks in time of wreck.

Joint Stock Company.— An association the membership in which is attained by the purchase of stock which is issued in shares.

Judgment Note.— A promissory note to which a power of attorney to appear and confess judgment for the sum named has been attached.

Killing.— A very large profit made as the result of a "corner," or a condition of panic.

Lake-and-Rail.— Signifying transportation in part on the Great Lakes and in part by railroad; used generally as to a combined rate for such service.

Lamb.— A term used in the stock exchange to denote an inexperienced person who has made losing investments.

Lay-days.— The stipulated number of days allowed to a charterer for the shipping or unloading of a vessel.

Lease.— The grant of temporary possession, as of lands or tenements, for a fixed compensation, and a specified length of time. The person granting this right is called the "Lessor" the person accepting the grant is the "Lessee," or " Leaseholder."

Letter of Advice, or simply, Advice.— A notification of the fact to a party upon whom a bill of exchange has been drawn.

Letter of Credit.— A document, usually issued by bankers, authorizing their agents to pay a sum of money to the bearer.

Letter of Delegation.— See Delegation.

Lighterage.— The sum paid for unloading a ship's cargo by means of a lighter, or barges, and delivering it at a dock.

Limitation.— Many statutes fix a period after which debts cannot be collected. This period of limitation ranges in the different States from 6 to 20 years.

Limited Liability Company.— A concern the shareholders in which cannot be held responsible for the company's debts for more than the nominal value of their own shares.

Liquidation.— The act of winding up a business, or extended transaction.

Locum Tenens.— One who temporarily holds the place of another.

Long.— Having a large supply. A speculator is "long" of a certain stock when he has bought it largely.

Manifest.— A statement giving full details as to the items of a cargo and its consignees prepared before the sailing of a ship.

Manipulation.— Fictitious sales and purchases of stock through two allied brokers, at constantly rising or falling prices, for the purpose of creating an appearance of activity at the new prices.

Margin.— The percentage deposited by a speculator with the broker who buys or sells stock for him. This money is forfeited to the broker if the stock so rises or falls as to absorb it. The usual margin demanded is from 5 to 20 per cent on the face value of the stock dealt in.

Matched Order.— An order to sell and buy the same stock. See Manipulation.

Maturity.— The time at which notes, drafts, etc., become due.

Measurement Goods.— Light goods which are charged for carriage by bulk instead of weight.

Memorandum Sale.— The act of sending goods to a proposing buyer subject to his approval, title vesting in the intending seller until they have been accepted.

Moratorium.— A special enactment of a government deferring the time at which the payment of debts may be demanded for a certain specified period.

Mortgage.— A method of pledging property for debt in which the lender may foreclose upon the security if the interest agreed upon is not maintained.

Negotiable Paper.— An evidence of debt which can be transferred by indorsement to another.

Net.— The sum remaining, after all deductions for expenses, costs, etc., have been made.

Non-Cumulative Stock.— Stock on which dividends accumulate only when declared.

On Memorandum.— At a secret price agreed upon between the buyer and seller.

Open Order.— An order which is in force until countermanded.

Option.— The privilege of either receiving or supplying specified goods or stocks at a stated price agreed upon by the buyer and seller.

Outlawed.— As applied to a claim means that the time within which suit may be brought under the law has expired. In New York State the limit is six years from the time the last payment of interest was made.

Overdrawn.— A bank account is said to be overdrawn when checks amounting to more than the balance of the account have been drawn against it.

Par.— The face value of shares or bonds.

Pass Book.— A small book issued by bankers in which to show the receipts and payments made on a customer's account.

Passed Dividend.— Omission to declare a dividend at the accustomed date.

Per Procuration.— Abbreviated commonly to "P.p." meaning, by power of attorney — of the person whose name follows the two initials.

Permit.— The written authority to remove goods on which duty has been paid from the custom-house is called the revenue officer's "permit."

Piker.— One who trades in stocks in small lots.

Pinholed.— Exhibiting many pinholes — indicating, in the case of a certificate of stock, that it has changed owners several times, and is therefore of a speculative character.

Point.— In the price of stocks a point is 1 per cent; in cotton and coffee a point is 1-100 of one cent.

Pool.— A combination of mercantile and manufacturing interests to regulate production and prices.

Postdated.— As applied to a check, a date in the future. The check cannot be legally paid before the date it bears.

Preferred Creditor.— A creditor whose claim under the law takes precedence of payment over other claims.

Preferred Stock.— Stock upon which the dividends are first paid out of the earnings: what remains is paid to the common stock. Generally the preferred stock receives a certain designated percentage, and it may happen that the overplus will give the common stock a much larger dividend.

Premium.— When shares or bonds are quoted above par they are said to be " at a premium."

Price Current.— A list published by a merchant showing the prices at which goods are to be sold for a fixed period.

Price Mark.— The secret code of letters used in marking goods. One or more words are chosen having just 10 different letters, which are used to indicate the numerals 1 to 9 and 0. Supposing the code words are "white sugar," a price of $1.25 would be represented by whe; a price of $0.70 by ur; etc.

Price of Money.— The rate of discount at which money may be borrowed.

Prime Cost.— The first, or original cost of an article.

Pro Forma Invoice.— A statement of the condition of the market issued for the information of a prospective buyer. It may be presented in lieu of a formal invoice at the custom-house, where, if duly verified, it is accepted as a substitute.

Procurator.— The person who is empowered to act for another.

Procuration-fee.— The sum taken for effecting loans of money.

Pro Rata.— To distribute proportionally.

Promissory Note.— A written agreement to pay a specified sum of money at a certain time.

Proof in Bankruptcy.— An affidavit in which a creditor declares that his claim to bankrupt's estate is correctly stated.

Protest.— The certification by a notary that a note or bill of exchange was presented for acceptance or for payment, and the proper disposal refused. The protest binds the endorsers; without it, they are released from liability.

Proxy.— A term applied both to the person who acts for another and to the document that gives him the power to act.

Puts.— An option to deliver certain stock at a certain price at a future date. A term used in stock exchange speculation.

Pyramiding.— The speculative process of using the profits on stocks bought on margin in a rising market to buy other stocks also on margin. The term is applied also to selling on a declining market.

Qualified Endorsement.— An endorsement prefixed by the words "without recourse to"—signifying that the endorser simply passes his title to the paper, but disclaims responsibility for payment.

Quotation.— The prices at which goods are offered. Stock quotations are given in eighths of 1 per cent; cotton and coffee in 5-100 of one cent; pork, lard, and grain in eighths of one cent.

Rate of Exchange.— The sum given in one country's currency for the currency of another country. Rates of exchange fluctuate widely, being subject to many influences.

Rating.— The estimate of the financial soundness of a person or firm — as given by a qualified commercial agency.

Readjustment.— A voluntary reconstruction of the finances of a company: when the reconstruction is compelled by a court action, it is termed a reorganization.

Rebate.— A discount given by the bankers in return for ready-money payments.

Registered Bond.— A bond bearing the name of its owner and recorded as his property. The interest on such a bond is payable only to the registered owner. When the ownership is transferred, a new bond is issued to the new owner.

Reserve.— The sum kept for the purpose of enabling the holder to meet special contingencies.

Sack.— In the United States a "sack" of flour signifies 140 pounds; in Great Britain, 280 pounds.

Salvage.— A term applied both to the goods rescued and to the money paid for their rescue from damage or loss, especially at sea.

Scalper.— A speculator who aims for quick, small profits.

Scrip.— A provisional certificate, or receipt for money paid for fractional parts of shares or as instalments for shares to be exchanged for a more formal certificate when conditions agreed upon have been complied with. The possession of scrip does not carry voting privileges. Scrip is sometimes issued as a dividend on stock.

Secured Creditor.— A creditor whose claim is protected by a lien.

Securities.— Documents given as an evidence of debt.

Seller Four (or Ten, Twenty, Thirty or Sixty).— The right of the seller to deliver stock (on one day's notice) within the time specified. See Buyer Four

Set-off.— The balancing of one debt by another.

Share.— The unit, or one of the entire number of equal parts into which the capital stock of a company or corporation has been divided.

Shaving.— As applied to a note, buying it at a sum less than its value at regular legal interest or discount.

Shoestring.— A term applied to a small beginning of a speculation which results in large profits.

Short.— Owing stocks sold but not yet in hand. Such selling is done on the expectation that the price of such stocks will fall and that then they can be bought for delivery for less than they were sold for.

Sight Paper.— Bills of exchange, notes, etc., which are payable upon presentation.

Silent Partner.— A person who maintains an interest in a business enterprise but who takes no active part in its management.

Sinking Fund.— A fund constituted for a special purpose; usually for the amortization of a debt, as the redemption of bonds.

Smart Money.— Money paid for the privilege of being released from fulfilling a contract.

Spread.— A double speculation covering the option of a delivery of a designated stock at one price, or its purchase at another price. The speculator pays a sum of money for the option. See Back Spread.

Stock.— (*a*) The accumulation of merchandise in the possession of a merchant; (*b*) the share capital of a corporation.

Straddle.— The double privilege of either buying or selling a stock at a fixed price. The profit or loss depends wholly on the changes of the market.

Supercargo.— The person who has charge of a ship's cargo.

Suspension of Payment.— The act of discontinuing the payment of debts because of insolvency.

Tare.— A deduction made from the gross weight of goods to allow for the weight of the box, or package containing them.

Tender.— An offer, in writing, to perform some specific service or to supply certain articles at a specified rate and upon stipulated conditions.

Tolerance.— The limit of wear which a coin may sustain and still be worth its face value at the United States Treasury. For gold coins this limit is one-half of 1 per cent in 20 years use (from date): for a shorter period the tolerance is pro rata.. On silver and lesser coins the tolerance is without limit.

Tontine.— An annuity, in which the subscribers to the loan share under the benefit of survivorship, the share of each increasing as other subscribers die until the whole reverts to the last-living subscriber.

Trade Mark.— The special mark or brand used by a commercial firm to distinguish goods of their individual trade. Such a mark becomes the property of the firm, and is protected as such by the courts. It need not be registered at the Patent Office.

Tret.— A now almost obsolete custom of making an allowance to purchasers who were compelled to transport their own goods.

Truck System.— The system of paying employees partly or wholly in goods instead of money.

Ullage.— The estimated measure of the empty portion of a cask.

Unbalanced Bid.— A bid for the performance of work in which the rates specified for each of the various kinds of labor or material required have been based upon an erroneous estimate of the quantities of each, thus making a high bid appear as a low estimate.

Unearned Increment.— The increase in the value of land resulting from such general causes as the increase of population, etc., as distinguished from the increase due to the efforts of its individual owner.

Upset Price.— The lowest figure at which bids for property will be accepted at auction sales or other competitive buying.

Usance.— The time allowed for the payment of bills of exchange drawn on foreign countries. The term is also used as another word for interest.

Voucher.— A written document in proof of money transactions.

Washing.— The practice of buying and selling the same stock by a combination of brokers for the sole purpose of recording the quotations, and making it appear active. See Manipulation.

With Exchange.— As included in a draft, signifies that the cost of collection is to be paid by the payee of the draft.

COMMERCIAL TREATIES. Definition. Treaties of commerce and navigation are agreements between nations relative to the privileges and immunities which may be enjoyed by the commerce and by the citizens or subjects of each party to the treaty within the territory of the other. In general or specifically such treaties, conventions or agreements define the terms under which the citizens or subjects of each of the contracting governments may reside and pursue their industries and occupations within the territories of the other government, and under which the vessels and commerce of each may enter the ports, etc., of the other for trade and transportation. The object of such treaties is to procure the greatest possible freedom from discrimination in the pursuit of trade and the expansion of industries, and to this end they are reciprocal in terms.

In Case of War.— Permanent rights and general arrangements made between countries by treaty do not cease on the occurrence of war, but are, at the most, only suspended while the war lasts. (U. S. Supreme Court 1823—8 Wheat. 464, 494 — Moore, Vol. V).

Modern Policy.— A policy of discrimination in favor of one foreign nation as against others is repugnant to the modern spirit of commerce. The application of the principle that a favor granted by one nation to another must be equally extended to all other nations for like consideration is now almost universal. Usually nations entering into a treaty of commerce and navigation agree, reciprocally, to extend to the citizens or subjects and to the commerce of the other within its territories the same privileges that are enjoyed by natives, under the laws of the nation within whose territories such privileges are granted.

Great Britain, France and Germany.— Great Britain, France and Germany has each a distinct policy as to concessions for trade expansion, each applying a form of discrimination in its own favor without violation of the principle of equality of treatment of foreign nations. Great Britain, as a free trade nation, opposes the employment of discriminating customs duties and places the broadest possible construction upon the «most favored nation» principle. The policy of France has been that of specific reservations favorable to her own citizens, but is tending toward greater liberality. In 1882 she terminated all her European tariff treaties, and in 1892 adopted a minimum tariff for all nations with whom she had a most favored nation agreement and a maximum tariff for all others. The Entente Cordiale convention between France and Great Britain (1904) made provision for equality of import, customs dues, etc., as to trade, commerce and navigation facilities of each with Morocco and Egypt; with reference to the Suez Canal and Gibraltar and as to fisheries in certain portions of the territorial waters of Newfoundland. In 1907 a reciprocal treaty was entered into between the two governments as to Canada, dealing with specific schedules, later (1909) enlarged in scope.

Germany in 1902 adopted a tariff system which was put into effect in 1906, making an increase in tariff rates, but providing lesser or «conventional» rates to be made effective by commercial treaties. The most favored nation clause in existing treaties of the empire was terminated and in 1905 treaties were made with Austria-Hungary, Russia, Italy, Switzerland, Belgium, Rumania and Serbia, by which these countries get the benefit of the «conventional» rates.

United States.— In the enactment of the 1909 tariff the United States adopted the maximum and minimum system effecting commercial agreements, but preserved the most favored nation principle as interpreted by this government. A concession of the lower rates was accorded to countries not unduly discriminating against the United States, and all countries now enjoy this concession.

Most Favored Nation.— The most favored nation clause, contained in nearly all treaties, may be declared in a few words with respect to each provision of a treaty, or be made the subject of a separate article. The form approved by the United States is: «Except as otherwise expressly provided in this treaty, the High Contracting Parties agree that, in all that concerns commerce and navigation, any privilege, favor or immunity which either contracting party has actually granted, or may hereafter grant, to the citizens or subjects of any other State shall be extended to the citizens or subjects of the other contracting party *gratuitously if the concession in favor of that other State shall have been gratuitous, and on the same or equivalent conditions, if the concession shall have been conditional.*»

The United States construes the most favored nation clause to imply a reservation as to favors granted gratuitously, as expressed in the above article, whether so stated in exact terms or not. (Adams, 1817; and adhered to by United States State Department). Great Britain and some others contend that there is no such reservation unless expressed in terms.

Form and Scope of Commercial Treaties. —The most recent commercial treaty of the United States is that made with Japan and proclaimed in 1911, superseding that of 1894. In express terms, this treaty provides:

«The citizens or subjects of each of the High Contracting Parties shall have liberty to enter, travel and reside in the territories of the other, to carry on trade, wholesale or retail, to own or lease and occupy houses, manufactures, warehouses and shops, to employ agents of their own choice, to lease land for residential and commercial purposes, and generally to do anything incident to or necessary for trade upon the same terms as native citizens or subjects, submitting themselves to the laws and regulations there established.

«They shall not be compelled, under any pretext whatever, to pay any charges or taxes other or higher than those that are or may be paid by native citizens or subjects.

«The citizens or subjects of each of the High Contracting Parties shall receive, in the territories of the other, the most constant protection and security for their persons and property, and shall enjoy in this respect the same rights and privileges as are or may be granted to native citizens or subjects, on their submitting themselves to the conditions imposed upon the native citizens or subjects.

«They shall, however, be exempt in the territories of the other from compulsory military service, either on land or sea, in the regular forces or the national guard, or in the militia; from all contributions imposed in lieu of personal service, and from all forced loans or military exactions or conditions.»

Other articles of the treaty provide that the dwellings, manufactures and shops of the citizens or subjects of one country in the territories of the other, and all premises appertaining thereto shall be respected . . . That there shall be no domiciliary search of premises nor examination of books, papers or accounts, except under conditions prescribed by law for the natives . . . Provide for the appointment of consular officers, with all the authority and immunity accorded those of any nation, in all ports, cities or places opened to commerce to any nation. . . . That there shall be freedom of commerce, reciprocally between the two countries, the citizens of each, equally with those of the most favored nation, having liberty to come with their ships and cargoes to all places, ports and rivers opened to foreign commerce, subject to the laws of the country into which they come. . . . That the import on articles imported shall be regulated by treaty or internal legislation . . . That no export duties or charges shall be made nor prohibition of export or import imposed, except such as apply to all foreign nations, this not to apply, however, to prohibitions imposed as sanitary measures or to protect animals and useful plants. . . . Reciprocal enjoyment upon equal terms is accorded to the people of both countries in the territories of the other, in exemptions from transit dues and privileges relative to warehousing, bounties, facilities and drawbacks.

Limited liability and other companies and associations, commercial, industrial and financial, already or hereafter to be organized in accordance with the laws of either country and domiciled in the territories of such country, are authorized, in the territories of the other country, to exercise their rights and appear in the courts either as plaintiffs or defendants, subject to the laws of such other country. This stipulation has no bearing upon the question of whether a company or association organized in one of the two countries will or will not be permitted to transact its business or industry in the other, this permission remaining always subject to the laws and regulations enacted or established in the respective countries or in any part thereof.

No discrimination is permitted by either country against the vessels of the other in the matter of import charges, reciprocal equality of treatment being accorded whether articles of import come directly from the place of origin or from any other foreign place. No discrimination of any sort as to either import or export is permitted. No duties of tonnage, harbor, pilotage, quarantine or other similar or corresponding duties, are to be levied except as applied to vessels of the most favored nation. Coasting trade is to be regulated by the laws of the respective countries, but each is to have the same treatment as that accorded the most favored nation. Rights as to trademarks, designs and patents are reciprocally the same as those accorded to natives; and the general declaration as to most favored nation is incorporated as a separate article of the treaty.

This treaty illustrated the general scope and purpose of such compacts between nations for reciprocal treatment of commerce and navigation. Local laws, habits and conditions require variations in form, and national policies determine how far such engagements may be extended to the colonies of a nation, or what ports may be closed to all foreign commerce.

Open Ports.— The United States, by an act of Congress approved 24 May 1828 opened all ports of this country to the vessels of all nations on the same terms as our own vessels in return for reciprocal treatment, without discrimination as to the nature of the merchandise carried or the ports where laden. In general, throughout the world, ports that are open to foreign commerce are open to all foreign nations on equal terms.

Retaliation and Embargo.—The application of the principle of retaliation and embargo has in recent years been generally recognized to be detrimental to expansion of commerce and unprofitable to the nation applying it. Any departure from the most favored nation principle reciprocally applied meets with disfavor among nations engaged in commerce. Attempts by various nations to apply such discriminations, for profit or in resentment, have not been beneficial to their own commerce.

Treaty Tariffs.— Reciprocal benefits from reductions in tariff dues are resorted to for the encouragement of better commercial relations between rival nations, but customarily the most favored nation principle is observed, at least in theory. Reciprocal tariff treaties with South and Central American republics by the United States under the provisions of the McKinley tariff act failed of ratification. Similar treaties made with leading foreign countries under a provision of the tariff act of 1897 were terminated on account of the constitutional objection to tariff regulations not approved by legislative enactment, and in the place of these the maximum and minimum system adopted by the tariff act of 1909 was applied to our commercial relations. This act provided that the minimum rates (a reduction of 25 per cent) might be collected from countries which do not unduly discriminate against the United States, the higher rates to apply to all others. President Taft proclaimed the lower rates to all countries, after the adjustment of some differences with Germany and France (1910). France and Germany also have the maximum and minimum system, under which (in their practice) discriminations occur.

The Open Door.— At the instance of the United States in 1899–1905, agreements were entered into between the United States and France, Germany, Great Britain, Italy, Japan and Russia, extending the enjoyment of perfect equality of treatment for their commerce and navigation within the «spheres of influence» over which any should exercise control in China, the most favored nation provision being the ruling principle.

The treaty between Great Britain and Japan (1905) provided for «The preservation of the common interests of all Powers in China, by insuring the independence and integrity of the Chinese Empire and the principle of equal opportunity for the commerce and industry of all nations in China.» It also recognized the paramount right of Japan to take measures of guidance and control over Korea, «providing always that such measures are not contrary to the principle of equal opportunity for the commerce and industries of all nations.»

Special Features of United States Treaties. — By notice of the United States, the «most favored nation» clause in the (1850) treaty with Switzerland was «arrested» in 1899, together with some other articles, the general features of the treaty remaining in force.

The *Argentine* treaty (1853) provides that in case of war between the two countries, the citizens of either of them residing in the territory of the other shall have the privilege of remaining and continuing their trade or occupation therein without any manner of interruption so long as they behave peaceably and commit no offense against the law; and their effects and property, whether entrusted to individuals or to the state, shall not be liable to seizure or sequestration, or any other demands than those which may be made upon the like effects or property belonging to the native inhabitants of the state in which such citizens may reside. Provision is made also for religious liberty and the right of burial in grounds owned by aliens.

The *Belgian* treaty (1875) reserves the right on the part of Belgium to grant special importation privileges to products of her national fisheries, and provides for the termination of the most favored nation clause by either party by one year's notice, without affecting the other provisions of the treaty.

The *Bolivian* treaty (1858, proclaimed 1863) makes reservation of waterways artificially rendered navigable, while opening freely all others under terms of the favored nation provision. This treaty also grants, reciprocally, the right of refuge or asylum to vessels of either country, «whether merchant or of war,» from «stress of weather, pursuit of pirates or of enemies . . . giving them all favor and protection for repairing their ships and placing themselves in a situation to continue their voyage without obstacle or hindrance of any kind.» All the provisions of this article apply to privateers or private vessels of war as well as to public until the two countries relinquish this right in consideration of the general relinquishment of the right of capture of private property upon the high seas.

Free Ships and Free Goods.— In the Bolivian treaty and other treaties of about that period, some of which, like that of Bolivia, are still in force, the following broad principle of international law is made: «The two High Contracting Parties recognize as permanent and immutable the following principle, to wit: (1) That free ships make free goods, that is to say, that the effects or goods belonging to the subjects or citizens of a Power or State at war are free from capture or confiscation when found on board a neutral vessel, with the exception of articles contraband of war. (2) That the property of neutrals on board an enemy's vessel is not subject to confiscation unless the same be contraband of war. The like neutrality shall be extended to persons who are on board a neutral ship with this effect, that although they may be enemies to both or either party, they are not to be taken out of that ship unless they are officers or soldiers, and in the actual service of the enemies. The contracting parties engage to apply these principles to the commerce and navigation of all such Powers and States as shall consent to adopt them as permanent and immutable.»

The treaty enumerates articles which shall be regarded as contraband of war, limiting these to arms, munitions, uniforms, horses and actual military equipment, and extending liberty of navigation to all merchandise other than the character of articles enumerated.

In case of war between the two countries, the merchants of either doing business within the territory of the other must depart within six months if on the coast or within one year if in the interior. All of other occupation may remain.

The *Brazilian* treaty (1828), of similar character, was abrogated in 1841, except as to the most favored nation clause and general provisions for freedom of commerce and navigation. A reciprocity treaty made in 1906 was terminated under provisions of the United States Tariff Act of 1909.

The *Chilian* treaty (1832), similar to that with Bolivia, was abrogated in 1850.

The *Chinese* treaty of 1903 re-enacts provisions of treaties then in force except in so far as they are modified by other treaties to which the United States is a party. The broadest most favored nation clause is provided by this treaty. The «spheres of influence» open door is provided by agreement of the Powers.

The *Colombian* treaty (1846) contains the «Free ships make free goods» article of the Bolivian treaty, to which it is similar.

The *Cuban* relations (1902) are exceptional, articles from the Island being admitted to the United States at a reduction of 20 per cent and articles to Cuba at a reduction of from 20 to 40 per cent.

The treaty with *Denmark* omits the most favored nation clause.

The *Dominican* treaty was abrogated in 1898. Now the United States supervises the collection and application of Dominican revenues.

The *Ecuadorian* treaty (1839) was terminated in 1892.

In the treaties with *Egypt and Ethiopia* the most favored nation clause is incorporated.

The «temporary convention» entered into with *France* in 1822, for two years, or «until the conclusion of a definite treaty,» is still in force. It provides discriminating duties during a period of four years only; so that now it provides that the «duties of tonnage, lighter-money, pilotage, port charges, brokerage and all other duties on foreign shipping . . . shall not exceed in France, for vessels of the United States, five francs per ton of the vessel's American register; nor for vessels of France in the United States, ninety-four cents per ton of the vessel's French passport»; and that no discriminating dues shall be levied by either country on goods transported in vessels of the other.

Germany renounced her reciprocity treaty with the United States in 1906 — before all similar treaties were legislated out of existence by the United States Tariff Act of 1909. Treaties with all Germanic governments made prior to the formation of the German Empire in 1871, not conflicting with the Prussian treaty, were assumed by the empire. The United States does not stand in «most favored nation» relations with Germany, so as to enjoy the minimum tariff rates of that country, but an arrangement was entered into in 1910 satisfying the requirements of the United States for the extension of the minimum United States tariff rates to Germany.

The treaty with *Great Britain* made in 1815 was indefinitely extended in 1827. It applied the favored nation clause to British East Indies as well as to England, but prohibits commerce by American vessels with India and Cape of Good Hope. Reciprocal relations between the United States and Canada, based upon an accommodation of customs dues and the free entry of a specified list of articles into each country, are established by a treaty approved by legislative action by the United States Congress in 1891.

The *Italian* treaty (1871) contains the «Free ships make free goods» declaration and agrees «that a state of war between one of them and a third Power shall not, except in the case of blockade and contraband of war, affect neutral commerce of the other,» defining an effective blockade in terms, so that there shall be no misunderstanding.

The *Korean* treaty (1882), the execution of which was assumed by Japan in 1905, with the proviso that Korea should make no more treaties except through Japan, contains the most favored nation clause, temporarily recognized extraterritorial jurisdiction of the United States and confined commerce to the coast, prohibiting interior trading.

The *Mexican* commercial reciprocity treaty of 1884 lapsed in 1887, because of a failure on the part of the United States Congress to enact tariff legislation essential to its operation.

The *Netherlands* treaty (1852) regards trade between the East Indies of the Netherlands as coast trade and reserves the right to discriminate in import and export duties in favor of direct trade between Holland and her colonies, but grants to American vessels the same privileges as those under the Dutch flag.

The *Serbian* treaty (1881) excepts local traffic with neighboring states in the application of the most favored nation clause.

The *Russian* convention (1832) was terminated by a resolution of the United States Congress in 1911 because «no longer responsive in various respects to the political principles and commercial needs of the two countries»; and because «the construction placed by the respective contracting parties differ upon matters of fundamental importance and interest to each.»

The United States has no commercial treaty with any of the following nations, but they have treaties with other nations as follows:

Brazil has commercial treaties with France (1900), Italy (1900) and Japan (1895).

Chile has a commercial treaty with Japan (1897).

Ecuador has treaties with France (1898) and Italy (1900).

Guatemala made a treaty with Germany in 1887 until 1911.

Mexico has treaties with France (1888), Germany (1882), Great Britain (1888), Italy (1900) and Japan (1888).

Nicaragua has treaties with France (1900), Germany (1896), Great Britain (1905) and Italy (1906).

Peru has treaties with Great Britain (1850), Italy (1874) and Japan (1895).

Salvador has a treaty with France (1901).

Uruguay has treaties with France (1892), Germany (1892) and Great Britain (1885).

Venezuela has treaties with France (1902), Great Britain (1825) and Italy (1861).

JOHN PIERCE MILLER.

COMMERCY, kō'mär'sē', France, town in northeast France, in the department of the Meuse, on the left bank of the Meuse River, about 180 miles east of Paris. In its ancient castle the Cardinal de Retz wrote his memoirs. The town is tolerably well built, and its industries include ironworking, boot and nail making, hosiery, embroidery, tanning and brewing. The cavalry barrack was once the residence of King Stanislas of Poland. Pop. 8,876.

COMMERSON, kō-mär-sōṅ, **Philibert**, French botanist: b. Chatillon-les-Dombes, 18 Nov. 1727; d. Mauritius 1773. At the request of Linnæus he composed a treatise on the ‹Fishes of the Mediterranean,› the most important ichthyological work that has yet appeared. In 1767, at the command of the king of France, he accompanied Bougainville on his voyage round the world. He died on the Isle de France (Mauritius), after residing there for about four years, which he spent in gathering and correlating and studying a vast amount of material which helped greatly the study of biology. He wrote, among other things, a botanical martyrology — a biography of those who have fallen victims to their efforts in the cause of botany. He left his plants, drawings and papers to the royal cabinet at Paris. Commersonia, a genus of the family *Sterculiaceæ*, was named in his honor.

COMMINATION, an office in the liturgy of the Church of England, appointed to be read on Ash Wednesday (the first day of Lent), containing a recital of God's anger and threatenings toward sinners.

COMMINES, kō-mēns, or **COMINES**, France and Belgium, towns on opposite sides of the Lys, eight miles north of Lille. The one on the right bank is in the department of the Nord, France, and communicates by a drawbridge with the other, which is in the province of West Flanders, Belgium. Anciently they formed a single town, which was fortified and had a castle, in which the celebrated historian, Philippe de Commines, was born. The manufactures are chiefly ribbons and cotton goods, tanning and cutlery. Pop. of French Commines, 8,575; of Belgian Commines, 6,641.

COMMISSARIAT, kŏm-mĭs-săr'ĭ-ạt, that department of an army which provides provisions, forage, camp equipage and all the daily necessaries, other than those connected with actual fighting. Up till 1912 the provisioning of the United States army was in the care of the Department of Subsistence; but in that year this department was united with the quartermaster's and pay departments into one of supply under the title of the Quartermaster's Corps, and charged with the provision of subsistence, pay, transportation, clothing and quarters. In the British army the duties of the commissariat have been managed by different bodies at different times, and at present there is no department so named. The commissariat duties now partly fall on the Army Service Corps, while there is also an ordnance store department for the supply of war provisions. It is only in the latter body that there are officers designated commissaries.

COMMISSARY (L. *commissus*, pp. of *committere*, commit, Fr. *commissaire*, one entrusted with a task, duty or office). In a general sense a commissary is, as its root meaning signifies, one to whom some charge, duty or office is committed by a superior power; hence one who is sent, with delegated power, to execute some official duty in a certain place. Here it has the sense of commissioner. An officer of a bishop who exercises spiritual jurisdiction in remote parts of a diocese, or one entrusted with the performance of duties in the bishop's absence. In *Scotts law* a commissary is a judge in a Commissary Court (q.v.). For this term in its military sense, see COMMISSARIAT.

COMMISSARY COURT, in *Scotts law*, was a Supreme or High Court established in Edinburgh in the 16th century which took to itself the duties formerly incumbent upon and performed by the bishops' commissaries. It had jurisdiction over actions for divorce, declarator of marriage and nullity of the same and all matters related thereto. This court, which was abolished in 1836, is embodied in the powers of the Court of Sessions. A second meaning of this term is that of a Sheriff's Court or County Court having the power to decree and confirm executors to deceased persons leaving property in Scotland. See COMMISSARY.

COMMISSION. (1) Formal act of trust; a warrant by which any trust is held or authority exercised. (2) A written document investing a person with an office or certain authority. (3) A certificate issued by authority by which a military officer is constituted; as, a captain's commission. (4) A body of persons joined in an office or trust, or their appointment; as, a building commission. (5) Brokerage, allowance or compensation made to a factor, agent, etc., for transacting the business of another; as one per cent commission on sales. (6) A warship is said to be «in commission» when she is fitted out for service and her commanding officer has taken charge under his commission (see definition (3), above). (7) In an official sense, a commission is a legally created body of persons invested with limited but well-defined jurisdiction, as the Interstate Commerce Commission, the Civil Service Commission, the Anthracite Coal Commission, etc.

Commission of Bankruptcy.— A commission appointed to investigate the facts relative to an alleged bankruptcy and to secure all available assets and effects for the creditors concerned.

COMMISSION, Governmental. A more or less temporary board to which authority is delegated for a specific purpose. Commissions may be used either for domestic government or for international arbitration. Among the more important commissions which have been employed in the United States for the settlement of internal problems are the Interstate Commerce Commission and the Industrial Relations Commission (qq.v.). In Great Britain a recognized means of collecting information for the purposes of determining a policy or formulating legislation is the employment of commissions of inquiry. These are classed as royal, statutory or departmental, according to whether they are appointed by a command of the Crown, by an act of Parliament or by a treasury minute or the authority of a Secretary of State. The authority of these commissions is dependent on the particular terms of their creation.

The United States has often made use of commissions to adjust the claims of individual citizens with reference to international disputes. Commissions of this sort were employed in connection with the Treaty of 1819 with Spain, in which Florida was ceded; under the Treaty of 1826 with Great Britain, to distribute the indemnity granted for slaves deported in violation of the Treaty of Ghent; under the Treaty of 1831 with France, to distribute the indemnity for the Spoliation Claims; and under the Treaty of 1871 with Great Britain, to distribute the indemnity for the Alabama Claims.

Arbitrations are usually carried on by international commissions, which may or may not contain, in addition to the representatives of the nations involved in the dispute, the representatives of disinterested neutral nations. The commission may have authority sufficiently wide to settle the entire question at issue, or it may recommend courses to the governments concerned, without imparting to these recommendations any binding force. See Arbitration; Bering Sea Controversy; Boundaries of the United States; and the accounts of the various boundary and fisheries disputes between England and America which were likewise settled by commissions.

COMMISSION, Military, a certificate which entitles one to execute the more important functions of command or staff duty in an army or navy. They are granted by the head of the government, and in the United States are confirmed by the Senate and are made public through the adjutant-general's department. In the national guards of the several States they are granted by the governor. In general, commissions are granted after courses of training such as those discussed under the heads of Military Academy, United States; Military Education; Naval Academy, United States. These are generally supplemented by systems of examination whereby qualified non-commissioned officers or warrant officers may acquire commissions. In most European armies certain social or financial qualifications are required for commissions. Up to 1871, when Gladstone abolished it notwithstanding vigorous opposition, a system of purchase of commissions existed in Great Britain, except in such technical arms as the engineers and artillery and in a few other organizations. This system, initiated in the time of Charles II, continually became more expensive, until in 1854, during the Crimean War, the prices ranged from £450 for the commission of an ensign in the line to £7,250 for the commission of a lieutenant-colonel of footguards. Under the present system in times of peace, besides the regular course of training as cadet and the examinations given to highly recommended non-commissioned officers, the avenues of approach to commissions in the British army are the officers training corps of the universities, the special reserve of officers and the territorial force. In the United States army, besides West Point and promotion from the ranks, commissions may be obtained on examination and appointment from civil life, by specially recommended men from various training corps at educational institutions where army officers are stationed, and in the Officers Reserve Corps, by the methods explained in the article on that corps. In the European War, special training courses for aspirants to commissions were initiated at Plattsburg and elsewhere. Of course, in all armies, the bars to commissions — which are then usually temporary — are greatly let down in times of war, and it is possible for a qualified enlisted man or civilian to get a commission without going through the course of training or the highly technical examinations necessary in times of peace. See Rank.

COMMISSION FORM OF GOVERNMENT. Definition and Origin.— The commission form of government is that system of city administration in which all legislative and executive powers are vested in a single body of five elective commissioners or councilmen. The plan originated in Galveston, Tex., in 1901. Prior to that time all American cities were governed by a mayor and various administrative boards exercising the executive functions of government and by a city council of one or two chambers exercising the legislative power. The Galveston experiment accordingly marked a departure from the traditional principle of division of powers in American municipal affairs. Its adoption in Galveston was intended as a temporary measure to carry the city through the grave financial emergency caused by a tidal inundation which had destroyed a great deal of private and municipal property in September 1900. But the commission plan proved successful in its workings and soon attracted the attention of other communities.

Outline of the Galveston Plan.— As originally framed, the commission plan in Galveston provided that all powers formerly vested in the mayor, the various administrative boards and the city council should be vested in a body of five citizens of whom three were to be appointed by the governor of Texas and two elected at large by the voters of Galveston. The provision for the appointment of three commissioners by the governor was decided by the courts to be unconstitutional, however, and the scheme was amended to provide for the election of all five commissioners. At the ensuing election the voters endorsed the commissioners who had been already appointed by the governor. Under the terms of the charter of 1901, as thus amended in 1903, the members of the commission were to serve for a two-year term and one of the commissioners was given the title of mayor-president but with no special functions save that of acting as chairman at meetings of the commission. It was provided that the commission should hold regular sessions, open to the public, and that by a majority vote of its members it should enact municipal ordinances, make the appropriations, award all contracts for public work and determine all appointments to positions in the city's service. It was further provided that the commissioners should, by majority vote, apportion among themselves the headships of the four main departments of civic administration, namely, finance and revenue, waterworks and sewerage, police and fire protection, and streets and public property. The mayor-president was not to be assigned to the headship of any department but to exert a co-ordinating influence upon them all. These were the essentials of the Galveston Plan.

Extension to Other Texan Cities.— Although it had been prepared hastily, with little or no experience elsewhere to serve as a guide, the Galveston experiment soon demonstrated its success. When the commissioners took over their duties the city had already defaulted in the payment of interest upon its debt; its bonds were selling at 40 per cent below parity and it had a large floating debt which could not be funded. Within a few years, however, this situation had been enormously improved. The city was once again able to pay its way in spite of the great burdens due to the cost of reconstructing the inundated sections. Accordingly, what had been designed as a makeshift to tide over a serious emergency not only became a permanent scheme of government for Galveston but was within a few years adopted by the other cities of Texas.

The Des Moines Plan.— In due course this Galveston system found its advocates in other States of the Union. Its progress was slow, however, because of the feeling that the plan concentrated too much power in the hands of a small group of men. While retaining its main principles, therefore, some cities sought to improve its practical applications. Most important among these was Des Moines, Iowa, which in 1907 adopted a new charter providing for a commission of five men nominated at a non-partisan, open primary and elected at large with additional provision for the use of the initiative and referendum by the voters of the city as well as (see INITIATIVE AND REFERENDUM) for the recall of one or more of the commissioners at any time after three months' tenure of office (see RECALL). The Des Moines plan further provided that no franchise giving rights in the city's streets should be valid until confirmed by popular vote. In general it aimed to establish what the Galveston plan did not seem to provide, namely, some adequate safeguards against the abuse of the large powers entrusted to the five commissioners.

Spread of the System.— With the new safeguards which the Des Moines plan added to the original scheme, the commission plan of city government gained great popularity. During the next few years it found adoption, without any change except as regards minor details, by many American cities, large and small, in nearly all the States of the Union. At the present time more than 300 municipalities of all sizes are governed by commissions. The majority of these are small communities with populations not exceeding 10,000; but some of the largest cities of the United States, notably Buffalo, New Orleans, Jersey City, Portland, Saint Paul and Oakland are included in the list. Among commission governed cities there are now six with populations exceeding 200,000 and 13 with more than 100,000. Of the larger municipalities which once adopted the plan only two, Denver, Colo., and Salem, Mass., have since abandoned it.

The Commission-Manager Plan.— A further development of the original plan soon took place in the adoption by many cities of an arrangement which, while retaining the commission, established a new administrative post known as that of city manager. Under this plan the commission retains all its legislative and policy-determining powers but devolves responsibility for the actual administrative work upon a highly-paid, professional official who makes the subordinate appointments and is accountable for securing efficiency in the various departments. This variation of the original scheme is now used by 50 or more cities in addition to many others which have established the city manager plan in conjunction with a larger city council instead of a small commission. See CITY MANAGER.

Merits of the Commission Plan.— The chief advantages of the commission form of government are first of all the concentration of power in definite hands thus avoiding the delays, friction and evasion of responsibility which characterized the old system of government by a mayor, various boards and a double-chambered council. In the second place, by reducing the number of elective offices it has raised the plane of officeholding, securing for the commission citizens of a better type than those ordinarily elected to municipal positions. It has not wholly succeeded in ousting the professional office-seeker, but it has given the man of business ability a better opportunity to serve the city in an official capacity. In the third place, the commission plan has made possible the introduction of many notable improvements in the routine conduct of the city's business, as for example, improved methods of budget-making and accounting, the extension of the civil service system, publicity in the award of contracts, the development of new sources of city revenue, and the adoption of a pay-as-you-go policy in municipal finance. It has faciliated the introduction, in many cities, of the so-termed newer agencies of democracy such as the initiative and referendum, the recall, preferential voting, proportional representation, the short ballot and the open primary. Finally, it has had an educative value, awakening the interest of the citizens in their public affairs, making the government of the city simple and intelligible which is the first necessary step in making it responsible to them. More has been claimed for the plan, however, than it or any system of local government could of itself be expected to accomplish, but its substantial achievements are beyond question.

The Defects of Commission Government.— The chief objections to the commission form of city government, on the other hand, are that it may place a dangerously large amount of power in the hands of a few men and enable them, by collusion, to carry corruption or dishonesty a long way without detection. It is furthermore urged that the plan violates a cardinal principle of American government by vesting both the appropriating and the spending powers in the same hands, something that is not permitted in national or State government. There the tradition of checks and balances is still powerful. It is contended, however, that a legislative body ought to be fairly representative of all interests in the community and that a body whose membership is limited to five men cannot be adequately representative. Finally, there is the allegation which experience seems to support, that it divides among five men the responsibility which was formerly concentrated in one man, the mayor. In other words, the plan goes too far in one direction and not far enough in another. The commission is too small to be adequately representative as a legislative body and too large to be efficient as an administrative organ. The adoption of the city manager plan, with provision for a city council, is a recognition of this defect in the commission form of government.

Financial Results.— The financial results of the commission plan have been shown to be good as the result of a careful investigation made in 1916 by the United States Bureau of the Census. Comparing cities which have remained under the mayor and council framework with those which have had some years of experience with commission government the balance of advantage appears to rest with the latter in such matters as lowered tax rates, more efficient checks upon expenditure, better budget methods and a reduction on municipal debts. See Municipal Government; City Manager.

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William Bennett Munro,
Professor of Municipal Government, Harvard University.

COMMISSION MANAGER. See City Manager.

COMMISSION ON SOUTHERN RACE QUESTIONS. See University Commission on Southern Race Questions.

COMMISSIONAIRE, kŏm-mĭs-syô-nâr′, the attendant attached to European hotels, who awaits the arrival of the trains to secure customers, to look after their luggage, etc. He may also be employed as guide or otherwise. In London, Edinburgh and elsewhere bodies of commissionaires have been established, the men being drawn from the ranks of military pensioners of undoubted character. In a secondary sense a commissionaire is in general a kind of light porter or messenger.

COMMISSIONER, a member of a commission. See Commission.

COMMISSURE, an anatomical term applied to nervous connections between adjacent parts of the nervous system. Though it is not always used in quite the same way, the general signification of the term, and the physiological import of the structure, is that of a uniting bridge. It has the sense of a suture, seam, joint or closure, the places where two bodies or parts of a body meet or unite. In architecture the commissure is the joint between two stones formed by the application of the one to the other; in botany it signifies the face by which one carpel coheres to another; in anatomy it is the name for certain bands of nerve-tissue which connect the right and left parts of the brain with the spinal cord; while in zoology it is a nerve cord connecting the larger ganglia of the nerve system.

COMMITMENT, *in law,* a written warrant for the arrest of a person named or described therein; also, the placing of a person in jail, as by warrant, for crime, contempt or the like. The word is applied usually when the detention is for a short period, so as to secure bail or to hold for trial. A commitment is made only after the person to be committed has made his appearance or has been summoned, in which particular it differs materially from a warrant. Commitments may be made by civil courts, although they are more commonly made by criminal courts.

COMMITTEE, one or more persons elected or deputed from among a larger body to examine, consider and report on any matter of business.

Large deliberative assemblies, with a great variety of business coming before them from time to time, are unable, when sitting as a whole, sufficiently to discuss and investigate many subjects on which they are obliged to act. Committees, therefore, are appointed to examine and report to the assembly from which they are selected. In the legislative bodies of the United States and in the British Parliament — in fact, in all legislative bodies in representative governments — there are committees for various purposes. What are known as «standing committees» and «grand committees» are regularly appointed at the beginning of every session, and have a definite class of subjects with which to deal, the object being to divide the work of the assembly among several bodies, and so facilitate the progress of legislation. In the British Parliament there were formerly four grand committees — of Religion, of Grievances, of Courts of Justice and of Trade, but they fell into disuse and were discontinued in 1832. Another ancient committee is that of Privileges, which is still appointed at the beginning of every session, but has seldom any work to do, questions of privilege being generally laid before a select committee specially appointed. In the United States Congress there are numerous standing committees. Among the most important of them in both Senate and House (though each House has not the same committees) are those on Appropriations, Commerce, Elections, Foreign Affairs, Judiciary, Military and Naval Affairs, Rules and Ways and Means. (See Congress, United States). «Select committees» are appointed by both Houses of the British Parliament and of the United States Congress to take up special questions and investigate them previous to legislation. In these witnesses may be examined upon oath, and evidence of all kinds brought forward, the proceedings being such as could not be carried on before the whole House. When their reports are given in, measures may be based upon them and passed into law. What is known as a Committee of the Whole House can only be regarded as a committee in so far as its procedure is concerned, since it consists of all the members who are present. Matters of great concernment (as supply, ways and means, etc.) are usually referred to a committee of the whole House, in which bills, resolutions, etc., are debated and amended till they take a shape which meets the approbation of the majority. The sense of the whole assembly is better taken in this way, because in all committees the member is permitted to speak as often as he pleases. When in the British Parliament, the House is in committee, the chair is regularly taken by the chairman of committees, a member who receives a salary and holds the post during the duration of the Parliament, acting as deputy speaker. (See PARLIAMENT). When the House is desirous of forming itself into committee, the speaker, on motion, puts the question whether the House will resolve itself into a committee of the whole, to take into consideration such a matter, naming it. The previous question cannot be put in committee; nor can the House in committee adjourn, as ordinary committees may, but if the business is unfinished, must hold an entirely new sitting. If the business is finished, the chairman reports, either immediately, or, if the House wish, at a later period. The committee stage of a bill takes place between the second and third reading, when the measure is discussed clause by clause. Private bills are reported on by select committees.

In law, a committee is a guardian appointed to take charge of the person or estate of one who has been found to be of unsound mind, or who is laboring under some other disability. The next of kin is usually selected, but the appointment rests in the discretion of the court. It is the duty of the person appointed to take care of the incompetent.

COMMITTEE OF PUBLIC SAFETY (*Comité du Salut Publique*), a body elected by the French Convention, 6 April 1793, from among its own members, at first having limited power conferred upon it — that of supervising the executive and of accelerating its actions. Later, its powers became extended; all the executive authority passed into its hands, and the ministers became merely its scribes. At first composed of nine, it was increased to 12 members—Robespierre, Danton, Couthon, Saint-Just, Prieur, Robert-Lindet, Hérault de Séchelles, Jean-Bon Saint-André, Barrère, Carnot, Collot d'Herbois and Billaud-Varennes. In the terms of its constitution the members should have been elected only for one month, but all the above-mentioned held their seats for a whole year. The prevailing party acted on the ground that France, threatened from within and without, could not be governed as if at peace, but could only be saved by desperate measures, as in times of the greatest danger. But after the downfall of the Girondists, 1 and 2 June 1793, when the Mountain, on the recommendation of the Committee of Safety, declared that the population of France consisted of but two parties — patriots and enemies of the Revolution — and consigned the latter to the persecution of all good citizens, terror took the place of law. From this time the committee governed the Mountain party, and through it the Convention. As the sole rule of his conduct Robespierre declared that the mainspring of a popular government in a state of revolution was *la vertu et la terreur!* Carnot confined himself to the direction of the armies, and left to his colleagues the affairs of the interior. At the motion of these men the new constitution was suspended for a time, and the revolutionary government conferred on the Committee of Safety by a decree of the Convention of 4 Dec. 1793. The committee now instituted in all the communes of the republic, as judges of the suspected, revolutionary committees, composed of the most furious zealots: the number of these new tribunals was as great as 20,000. The last remaining forms of regular process were abolished; their place was supplied by violence, and often by avarice and folly. In this time of internal revolutions and danger from without, it was not in the power of man to restrain the exasperated fury which probably alone prevented France from being conquered. Finally Danton, who had absented himself for a time from the committee on account of the influence of Robespierre, declared himself against the system of bloodshed; and Robespierre himself acquiesced in the condemnation of the ringleaders of the Paris mob (24 March 1794), among whom was Hébert; but soon after (5 April) Danton, with Hérault de Séchelles, was himself overthrown by Robespierre. Till 28 July 1794 the latter now remained master of the lives of 30,000,000 of men. He appointed Fouquier-Tinville public accuser. Prisons were multiplied and crowded; the prisoners were cruelly treated, betrayed by spies and condemned without being allowed the privilege of defense; the property of all imprisoned on suspicion was confiscated, and the guillotine remained *en permanence.* The same violence was practised in the provinces by some of the delegates of the committee. Among the numberless victims of the system were the noble Malesherbes and the celebrated Lavoisier. The members of the Committee of Public Safety and of the *comité de sureté générale* at last disagreed among themselves. Each committee contained three parties. These, and not Tallien, were the real causes of the 9th Thermidor (27 July). In the Committee of Public Safety Robespierre, Couthon and Saint-Just (*gens de la haute main*) formed one party; Barrère, Billaud and Collot d'Herbois (*les gens revolutionnaires*) another, and Carnot, Prieur and Lindet (*les gens d'examen*) a third. In the *comité de sureté générale* one party comprised Vadier, Amor, Jagot, Louis (*du bas Rhin*) and Voulland (the *gens d'expédition*); to a second belonged Danton and Lebas (*écouteurs*); to the third Moïse Bayle, Lavicomterie, Elie Lacoste, Dubarran (*les gens de centrepoids*). Robespierre attempted to remove the unyielding Carnot from the Committee of Safety. On the other hand Billaud-Varennes labored to effect Robespierre's downfall. Couthon, Saint-Just, the Jacobins and the commune of Paris alone adhered to Robespierre. But when Saint-Just actually proposed in the committee a dictator-ship for the safety of the state an opposition was raised against Robespierre in the National Convention by Vadier, Collot d'Herbois, Billaud-Varennes, and especially by Tallien and Fréron; the dictator and his faction were proscribed, and the victory of Barras (q.v.) on the 9th Thermidor brought Robespierre, his brother, Saint-Just, Couthon and others, 105 in all, to the scaffold, 28 July. The Convention now recovered its authority; the Jacobins and the partisans of terrorism (*le queue de Robespierre*) were completely overthrown; at the same time the Convention gave the Committee of Safety and the revolutionary tribunal a more limited power and jurisdiction. The bloody despotism ceased; and when a new constitution introduced (28 Oct. 1795) a directorial government (see Directory), the Convention was dissolved, and with it sank into its grave the revolutionary government, the reign of terror and the Committee of Public Safety.

COMMITTEES OF CORRESPONDENCE, in American Revolutionary history, public functionaries of a type first appearing in England, created by the parliamentary party of the 17th century in their struggles with the Stuarts. In 1763, when the English government attempted to enforce the trade and navigation acts in America after the Peace of Paris, the colonial leaders advised the merchants to hold meetings and appoint committees to memorialize the legislature and correspond with each other to forward a union of interests. This was done in Massachusetts, Rhode Island and New York 1763–64. On 13 June 1764 the Massachusetts General Court appointed a committee to communicate to other colonial governments its instructions to its agent in London, to protest against the Sugar Act and the proposed Stamp Act. When the latter was passed in 1765, the Sons of Liberty formed committees of correspondence to organize resistance. Samuel Adams, during the decade 1764–74, constantly urged the adoption of this plan by the patriots of every town and county in each colony, and moved the general court to that effect in 1770–71. A few public bodies in the country appointed such committees, but there was no general concert. The payment of judges' salaries by the royal government in 1772 was seized upon by Adams as a fresh incitement, at first with scant effect, but on 21 November a slender town meeting at Faneuil Hall, Boston, appointed a correspondence committee of 21 to communicate with other Massachusetts towns concerning infringements of popular rights. It consisted of the foremost popular leaders — Adams, Otis, Warren, Quincy, etc.— and until late in 1774 (see Committees of Safety) remained the real executive of the town and largely of the province. A report of its first meeting was printed and sent to all the towns and to other provinces, and in a few weeks 80 Massachusetts towns had appointed similar committees, many more doing so in a short time. No fresh places in other colonies joined, though the report was printed in their newspapers. But the royal commission to investigate the burning of the *Gaspée* in Rhode Island and send the culprits to England for trial effected Adams' purpose — curiously, not in Rhode Island itself, but in Virginia, where the House of Burgesses, on 12 March 1773, appointed a committee of 11 to communicate with other colonies on the doings of the administration, especially in Rhode Island, and report. The plans were characteristically different, the Massachusetts being by the town voters, the Virginia by the legislature, but the latter was immediately effective in eliciting response. Committees were appointed by Rhode Island 7 May, Connecticut 21 May, New Hampshire 27 May, Massachusetts 28 May, South Carolina 8 July. This threat of united opposition daunted the government; the *Gaspée* prosecutions were not pressed, and the commission found adversely to its commander. There being nothing more to do, the legislative committees stopped for the time, after exchanging proceedings. The Boston committee alone continued its political activities, and the tea question (see Boston Tea Party) soon revived the others. The Boston committee, followed by that of Connecticut, sent out circulars urging the defeat of British purposes; and the former, by legal town-meeting, was made the executive of Boston. It called the committees of five surrounding towns into consultation, and sat "like a little Senate," Hutchinson said. Under its direction the tea was thrown into the harbor. The Tea Act roused the remaining colonies: Georgia in September, Maryland and Delaware in October, North Carolina in December, New York and New Jersey in February, chose legistive committees of correspondence; and new municipalities joined the movement — several in New Hampshire and Rhode Island and the city of New York. After the Boston Port Bill came into effect the Boston committee invited those of eight other towns to meet in Faneuil Hall, and the meeting sent circulars to the other colonies recommending suspension of trade with Great Britain, while the legislative committee was directed by the House to send copies of the Port Bill to other colonies and call attention to it as an attempt to suppress American liberty. The organization of the committees was at once enormously extended; almost every town, city or county had one, though a few dismissed theirs in fear of the coming storm. The Boston opposition attempted this, but were crushingly defeated. In the middle and southern colonies the committees were empowered, by the terms of their appointment, to elect deputies to meet with those of other committees, to consult on measures for the public good. The history of the committees from this time on is the history of the preliminaries of the Revolution. Consult Frothingham, 'Rise of the Republic' (1872); Howard, 'Preliminaries of the Revolution' (1905).

COMMITTEES OF SAFETY, in American Revolutionary history, these were a later outcome of the committees of correspondence (q.v.). In Massachusetts, as affairs drew toward a crisis, it became usual for towns to appoint three committees, of correspondence, of inspection and of safety. The first was to keep the community informed of dangers either legislative or executive, and concert measures of public good; the second to watch for violations of non-importation agreements, or attempts of loyalists to evade them; the third to act as general executive while the legal authority was in abeyance. In February 1776 these were regularly legalized by the General Court; but consolidated into one, called the "Committee of Correspondence, Inspection and

Safety,» to be elected annually by the towns. This possessed all the powers of the other three, but in addition was empowered to notify the proper authorities of all violation of any of the acts, resolves or recommendations of the legislature; also to send for persons and papers, call out the militia, take charge of confiscated property and prisoners of war, and carry out the laws against Tories. An appeal lay from them to the legislature, but was not often thought judicious. Previous to this, however, in October 1774, the first Provisional Congress of Massachusetts had appointed a provincial committee of safety, with 11 members, to act as the general executive of the province; and in the next few weeks it made arrangements to raise and support an army. On 9 Feb. 1775 the second Provincial Congress constituted five members a permanent executive, and instructed it to «alarum, muster and cause to be assembled with the utmost expedition, and completely armed, accoutred, and supplied, such and so many of the militia of the province as they shall judge necessary,» such levy to be made when the committee thought a forcible attempt was to be made to carry out the Boston Port Bill. It was this committee's decision to take possession of Charlestown and Dorchester Heights, on the rumor that Gage was to have heavy reinforcements and occupy them, which led to the battle of Bunker Hill. New York had also a committee of safety, of 100 men, but it is characteristic of the undeveloped politics of the time that several of these were conservatives who afterward joined the British side. Partly from this, and partly from the unwieldy size of the committee, an inner committee was formed consisting entirely of Sons of Liberty, and directed its operations. At the news of the battle of Lexington, they called a public meeting in New York at the city hall, and secured the arms and ammunition in the arsenal. John Lamb and Isaac Sears led the action, arrested all British vessels about to sail for Boston, locked up the custom-house, and discharged the cargo of a vessel detained by British authorities as loaded with supplies for the patriots, formed a military company, armed it from the arsenal, surprised and captured the chief depot of British stores at Turtle Bay, and when the British commander ordered his men to join the army in Boston, refused to allow them to take any arms but those in their hands. Otherwise they were to be allowed to embark unmolested. The more ardent members were displeased at this, but kept the letter of the promise and no more. The muskets being carried in wagons, they confiscated them as not «in the hands,» the soldiers declaring that they should not be used against their brethren in Boston. Consult for the functions of the committees, Sparks, ‹Life of Gouverneur Morris,› (Vol. I, Chap. 2), and Hunt, A., ‹Provincial Committees of Safety› (1904).

COMMODORE, in the United States navy, formerly an officer ranking next above a captain, and commanding a few ships when they were detached for any purpose from the rest of the fleet. The grade was abolished by Congress in 1899, when all commodores became rear-admirals. While there is no actual grade of commodore in the British navy, it is by courtesy applied to the commander of a flotilla of submarines, or to the captain in command of a squadron. The word is also a title given in courtesy to the president of a yachting club, or to the senior captain of a line of merchant vessels.

COMMODUS, kŏm′ mō-dŭs, **Lucius Ælius Aurelius**, Roman emperor: b. 161 A.D.; d. 31 Dec. 192. He was the son of Marcus Aurelius Antoninus and gave early proofs of his cruel and voluptuous character. On the death of Marcus Aurelius, 17 March 180 A.D., Commodus ascended the throne. A conspiracy against his life in which his sister Lucilla played a prominent part, having been discovered in 183, he showed himself a more execrable monster than even Caligula, Nero or Domitian. For his amusement he cut asunder persons, put out their eyes, mutilated their noses, ears, etc. His brutal character made him jealous of all those who had risen to prominence during his father's reign, and most of them were put out of the way. He was endowed with extraordinary strength, and often appeared in imitation of Hercules, dressed in a lion's skin, and armed with a club. To fill the treasury, exhausted by his extravagances, he imposed unusual taxes upon the people, sold governments and offices to the highest bidder, and pardoned criminals for money. To display his strength and skill in arms he appeared publicly in the amphitheatre. He is said to have fought in this way 735 times, and as his opponents were armed with weapons of tin or lead, while he was encased in impenetrable armor, he had naturally an easy victory on every occasion. In his combats with wild beasts he was securely protected by a screen of net work, through which he hurled his darts or shot his arrows. A part of the city having been consumed by fire, and the people reduced to despair by famine, disturbances broke out, and the Emperor was obliged to consent to the death of his minister, Cleander, who was charged with being the author of these calamities. He demanded that he be himself worshipped as a god under the title of Hercules Romanus. Commodus was strangled by the gladiator Narcissus, who was hired to commit the deed by Marcia, the mistress of Commodus, who had plotted with Lætus, the prefect, and Eclectus, the imperial chamberlain, to put him out of the way, and on the news of his death, which was reported to be the consequence of an apoplexy, the Senate declared him an enemy of the state, ordered his statues to be broken to pieces, and his name to be erased from all public inscriptions. Rome was indebted to him for her handsomest baths — the Thermæ Antonianæ. He established also an African fleet, in addition to the Egyptian one, for the purpose of supplying the city with corn.

COMMON, that which belongs as a privilege or right equally to more than one, to many, or to the public at large; free to all; general; universal; public; having no separate owner; as, the common weal. In Scotts Law, common good, taken in its widest sense, signified all the properties of a corporation over which the magistrates had a power of administration «solely for behoof of the corporation.» In the sense of that which is for the general public the Court of Common Pleas is often called the «Common Bench.»

«In common» has the legal sense of equal with another or with others, or for equal use or participation by two or more. Hence the old expression «tenants in common» which is still in use.

The word is also applied to an open and (generally) unenclosed space, the use of which is not restricted to any individual, but is free to the public or to a certain number. In most of the cities and towns in the United States there are considerable tracts of land appropriated to public use. These commons were generally laid out with the cities or towns where they are found, either by the original proprietors or by the early inhabitants.

In logic the word is applied to terms or names, in opposition to individual, singular or proper. «Common terms, therefore, are called ‘predicables’ (namely, affirmatively predicable), from their capability of being affirmed of others; a singular term, on the contrary, may be the subject of a proposition, but never the predicate unless it be of a negative proposition (as for example, the first-born of Isaac was not Jacob); or, unless the subject and predicate be only two expressions for the same individual object, as in some of the above instances.»

COMMON ACCIDENT, a term in logic used to denote a character or predicate which is nearly always or, it may be, always found in a certain kind of subject. See Logic.

COMMON ASSURANCES, *in law,* the legal evidence of the transfer of the title to property, as deeds or wills. In most countries such evidences must be registered in conformity with the provisions of the law in order to become operative and effective.

COMMON BENCH, the Court of Common Pleas. See Common.

COMMON-BUD, a term used in botany to indicate a bud which is, at one and the same time, a leaf-bud and a flower-bud.

COMMON CARRIERS, such as carry goods for hire indifferently for all persons. The term includes carriers by land and by water and is sometimes applied to those who regularly and as a matter of business convey messages. On the one hand they comprise stage-coach proprietors, railway companies, truckmen, wagoners and teamsters, car-men, porters and express companies, whether such persons undertake to convey goods from one portion of the same city to another, or through the whole extent of the country, or even from one country to another; and on the other hand they include the owners and masters of every kind of vessel or water-craft, who undertake to carry freight of any kind for all who choose to employ them, whether the extent of their navigation be from one continent to another or only in the coasting trade, or whether employed in lading or unlading goods or in ferrying, with whatever motive power they may adopt. (Story, Bailments, §§ 484–496). Common carriers are liable for all damage or loss during the transportation from any cause, except the act of God or the public enemy. Common carriers both by land or water, when they undertake the general business of carrying every kind of goods, are obliged to carry all which offer, and if they refuse without just excuse, they are liable to an action. Common carriers may qualify their common-law responsibility by special contract. The bill of lading is usually the written evidence of the contract between the parties. The responsibility of the carrier begins on receipt of the goods from the owner. Carriers of passengers are not held responsible as insurers of the safety of those whom they transport, as common carriers of goods are. They are, however, bound to a high degree of care in the selection of appliances, employees, etc., in order to secure the safety of their passengers. Extensive powers over carriers, especially in regard to the fixing of rates, are possessed by the Interstate Commerce Commission, appointed by the act of 1887. Consult Fetter, ‘The Law of Carriers of Passengers’ (Saint Paul 1897): Hutchinson, ‘Treatise on the Law of Carriers’ (Chicago 1891); Judson, ‘The Law of Interstate Commerce’ (Chicago 1905). See Commerce, Interstate.

COMMON COUNCIL, the council of a city or corporate town, empowered to make by-laws for the government of the citizens. In American cities the city council is generally composed of but one chamber, but the name may be, and sometimes is, applied to a body consisting of two cameras. They are elected by the people.

COMMON DIALECT, a name given to the common tongue of the educated classes in Greece and other countries after the death of Alexander the Great. This «dialect» which was both written and spoken was also known as the «Hellenic dialect,» a form of the Greek tongue much like pure Attic, which, with the writings of Aristotle, begins to change into the «common dialect.» The latter had pretty well changed into Byzantine Greek at the beginning of the 5th century.

COMMON DIVISOR, or **COMMON MEASURE,** *in mathematics,* a number that divides each of two or more given numbers exactly, that is, without leaving a remainder in the form of a whole number, fraction or decimal. The *theory of divisors* is that part or section of the theory of numbers relating to their divisibility; while the *method of divisors* is the means of finding the commensurable roots of an equation. By this method they are rendered integral, after which they are sought for among the factors of the absolute term.

COMMON FIELD, a term generally used in the plural to denote the arable land of a village community in ancient times. These lands were divided into three long, narrow strips and were cultivated in co-operation though the land was alloted to several owners. In French Canada and those parts of the south of the United States which formerly belonged to France small tracts of land, usually quite narrow and long, fenced in and cultivated by the inhabitants in general, were long known by the name of the common land or common field.

COMMON LAND, a term loosely used to indicate that land is held in severalty but used in common. It also has the signification of land owned by the community and used as a waste or open land for common pasturage. Such land has not been appropriated to cultivation by an individual. There was a great deal of such land in all the Latin-American countries less than half a century ago; and in certain retired communities considerable of it still exists, more especially in the Latin-American countries. It was a common manner of holding land among all primitive peoples given to the cultivation of the soil on a scale extensive enough to make the possession of land a consideration in the life of the community or of the individual.

COMMON LAW, the great body of unwritten law in England and the United States as distinguished from the written or statutory law. The ultimate sources of the common law of England are the usages and customs which were observed by the barbarous ancestors of the Saxon and Norman conquerors, and administered in their rude forest courts long before the beginning of their historic records. This origination is not peculiar to Teutonic law. "Custom is law," said Cicero. Usage, or rather the spontaneous evolution by the popular mind of rules, the existence of which is proved by their general observance, is the oldest form of law making. The criminal law was a major part of the early English as of every other rudimentary legal system. All law was penal in its beginning, and the licensed revenge of injured parties, next to popular opinion, was the most powerful means of enforcing customary rules of conduct in loosely organized primitive communities. Indeed, compounding for injury was the beginning of criminal and, also, of civil procedure; the privilege of paying "weregild" to buy off the avenger passed by almost imperceptible stages into the obligation to pay damages for breaches of contract as well as for injuries resulting from distinctively tortious acts. Oliver Wendell Holmes, Jr., now justice of the United States Supreme Court, in his 'Common Law,' published nearly 40 years ago, illustrated this evolution, and also the almost perfect parallel in the development of the Roman and Teutonic systems. A few examples of the early law of liability drawn from each of these systems may be useful as well as interesting. In the Twelve Tables (B.C. 451) it was provided that if an animal had done damage it must be surrendered to the injured party or his personal representatives, or compensation paid for the damage done. The same rule was applied (consult Gaius, 'Institutes') to the torts of children or slaves. The underlying idea in all these cases was the surrender of living things, from which an injury had proceeded, to the vengeance of the obligee; the owner's privilege to pay damages in compensation being in effect a right of ransom. The forfeiture of the thing causing injury was afterward extended to inanimate objects by the Roman law; but an even more revolutionary innovation was the making of a person answerable for the wrongs of a free man in his employ as well as for injuries caused by slaves and other persons and things over which he had, or claimed, a proprietary right. Failure to observe a contractual obligation might not be considered a wrong that would excite a desire for vengeance; still, it is provided in the Twelve Tables that an insolvent debtor should be surrendered to his creditors, who, after the observance of certain formalities, obtained the right to cut up the bankrupt's body and divide the parts among themselves. Now as to the Teutonic parallels: According to the Salic Law, if a man was killed by a domestic animal, the owner was required to pay one-half the composition (weregild) which he would have had to pay to buy off the blood feud if he himself had killed the man; for the other half he was required to surrender the animal to the complainant. The same law provided for payment of one-half the customary weregild where the slayer was a slave, and for the surrender of the latter to the vengeance of the blood kindred of the slain. In more primitive Teutonic law, as in the Twelve Tables, injuries done by animals were atoned for by their surrender alone. The 'Lex Saxonica' made the master responsible for wrongs done by his bondmen at his command and, according to the Thuringian law, the master was required to pay damages for all injuries resulting from the acts of his slaves. In the Kentish laws of Hlothaere and Eadric (A.D. 680) it is provided that if a slave slay a freeman . . . let the owner pay with 100 shillings and give up the slayer." According to the laws of Ine, "if a Wessex slave slay an Englishman, then shall he who owns him deliver him up to the lord and the kindred, or give 60 shillings for his life." (Consult Thorpe, 'Ancient Laws,' I, pp. 27, 29 and 149). In the laws of King Alfred (A.D. 871–901) is the provision that "if a neat wound a man let the neat (cattle) be delivered up or compounded for." (Thorpe, 'Ancient Laws,' I, p. 79). Here we have the successive and almost identical stages through which the law of an owner's liability passed in both the Roman and Teutonic systems, from the requirement to surrender the cause of injury to the payment of compensatory damages. In Alfred's laws may be found even a curious extension to inanimate objects of the injured parties' right of vengeance. It is there declared that a tree by which a man is slain, though without fault of the owner, shall be given to the kindred; which is not unlike the custom of the Kukis, a savage tribe in southern Asia, recorded by Tyler in his 'Primitive Culture,' that, if a man be killed by falling from a tree, his relatives take revenge by felling the tree and scattering it in chips. And the idea of avenging a death on the instrument which caused it persisted in English jurisprudence up to relatively modern times. A "deodand," the thing with which a homicide was committed, was regarded as accursed and was forfeited to the Crown, although the owner had nothing to do with the slaying. From a record (*tempus* Edward I) we learn "if a man fall from a tree, the tree is deodand; if he be drowned in a well, the well shall be filled up," while from the days of Elizabeth downward law students have been made familiar with the proposition: "If my horse strikes a man, and afterward I sell my horse, and after that the man dies, the horse shall be forfeited." The curse follows the deodand and nobody can acquire property therein. There is nothing in Teutonic law quite comparable in ferocity to the division of an insolvent debtor's body among his creditors, as authorized in the Twelve Tables; yet the early Teutonic law of suretyship was very severe. Down to the times of Charlemagne (800 A.D.), and later, a surety was a hostage and his life was forfeited if his principal defaulted in the performance of an obligation. "Bail is a prisoner's keeper and shall be charged for an escape, some say the bail shall be hanged in his place" — thus an opinion of Shard, a justice of the time of

Edward III, cited in Fitzherbert's 'Abridgment,' under title «Mainprise,» pl. 12.

The distinction is very properly made by American and English jurists between «written» and «unwritten» law. Even before the time of Lord Chief Justice Coke the term «written» was applied almost exclusively to statutory law; but there was a written law in England before Parliament came into existence, as the collections of laws going under the names of Alfred, Canute and other kings of the pre-Norman period indicate. William the Conqueror in the fourth year of his reign (1070) promulgated the so-called «Laws of Edward the Confessor,» his immediate predecessor and the last of the Saxon kings. These laws were collected by a grand committee of «wise and noble English (not Normans) learned in their laws and customs,» whom William had caused to be summoned from all parts of the country. The method adopted in this case bears a distant resemblance to the enactment of laws by a legislative body; but the legislation of the Norman monarchs, who governed without parliaments, usually took the form of a *carta* or charter. The «Great Charter,» or *Magna Carta,* is a glorified example. The «Laws of Edward the Confessor» are little more, however, than a collation of the laws of liability and compensation, whereof several examples are given in the foregoing paragraph. More instructive, though less authentic, than the collection just mentioned, is one bearing the name of the «Laws of Henry I,» a son of the Conqueror, who reigned from 1100 A.D. The work is a compilation, made by an unknown hand, of many things to be found in the earlier enactments, though some parts are extracted from the civil and canon law and there are several express references to the laws of the Salic as well as of the Ripuarian Franks. Notwithstanding its defects it provides better means of forming an opinion of the nature of law among the early English than does any other extant document. The impression given is, that there was a body of laws and customs sufficiently well ascertained for practical purposes, but that when anything in the nature of a legal principle or definition was required they were at the mercy of any person whom they respected as a learned man, and who was prepared to lay down a rule on his own or any other authority or no authority at all. Roman law must have been the source of many such legal principles, for none other was then in existence. The extent to which the civil law was drawn upon, probably, will never be clearly ascertained. The compilation of the «Laws and customs of England,» which bears the name of Glanville, Chief Justiciar in the reign of Henry II (1154–89), does not anywhere cite or refer to the Roman law as authority. It did not need to. For men to buy and sell, borrow and lend, hire and let, is in the nature of things and, in an even indifferently well-ordered community, customs and usages, whereby men will regulate the conduct of their affairs, are bound to spring up. Glanville's commentary on these transactions of ordinary life is in complete accord, however, with the Roman law. The principle of the *jus civilis* respecting «real contracts,» that the delivery of the object of an agreement created an obligation on the part of the receiver to complete the contract, had taken firm root in England before Bracton's time. The Roman principle as to the liability of the master for the default of his servant was first adopted in a case decided in the time of Edward III (reigned 1327–77) but the authority relied upon is the law of Oleron. The original English rule, as stated in the «Laws of Henry I,» was, that «the lord has to pay unless he can clear himself of complicity»; the Roman law held the master responsible even though himself guiltless of wrong. The Roman origin of the existing English rule on the subject appears clearly from the fact that for more than 400 years past every English court and every English law writer has repeated the shallow arguments whereby the Roman jurists have defended the principle of liability without default. While it seems rather illogical to call "unwritten" a body of laws recorded in thousands of volumes of printed reports and treatises, the distinction between this and the «written» law incorporated in statutes is completely justified. A statute law takes effect only from the time of its enactment and, generally speaking, affects only legal rights subsequently created or acquired. An «unwritten» law is presumed to have been always in effect, and to be applicable to rights acquired, or existing, in the remotest time past. When a court renders a decision in accord with an immemorial custom or usage it does not make a law; it merely records the fact of its existence, though the legal rule thus established may never before have been written down. The qualification "unwritten» is, therefore, quite properly given to such law. In their origin, indeed, legislative enactments and judicial pronouncements are indistinguishable. The sovereign himself, in theory and often in fact, dispensed justice in his court, and judicial pronouncements the same as royal ordinances or *cartæ* emanated from the king. The investiture of distinct officials with judicial functions, however, took place at an early date, and forms of action and rules of procedure, apparently, had been invented by the time of Henry I. Glanville in the succeeding reign speaks of the «Action of Debt» as ancient, and the «Action on Covenant» was probably established contemporaneously. A writ of «Debt» was a very primitive device, being a bare statement that so and so owed the plaintiff so much. It was employed in actions to enforce all legal obligations whether arising out of contracts (covenants accepted) or out of torts. A general denial by the defendant sufficed to defeat the action. It was for this reason that other writs of action (in assumpsit and in trespass, for instance) were invented. Special pleading became a fine art, giving opportunities for the exercise of refined legal ingenuity — the purpose being to narrow down the issue in a case to a single question of fact and a single point of law — and on this basis the structure of the common law has been mainly erected. Bracton, whose «Leges Angliæ» were written about 1258, drew the first four chapters of his work from the Roman law, but nine-tenths of his treatise is taken from the plea rolls of the courts. His extant «Note Book» contains a record of more than 2,000 cases, of which over 500 are cited in his work, and 350 folios of the latter, out of a total of 444 folios, are devoted to the law of «Actions.» From this time forth the law reports, the issue of which increases in volume from year to year, became the repositories of the judicially declared unwritten law. In the «Year Books» the report of a case generally consists of a statement of the form of action, the plea, a summary of the facts and the judgment of the court, whether for the plaintiff or the defendant; the rule of law involved must usually be inferred. From the time of Coke judicial opinions became more and more elaborate and, nowadays, they are frequently of inordinate length even in cases involving no point of particular novelty or importance, while the reporters follow no discoverable principle of selection in making up their volumes. The Roman system of laws begins and ends with a code. The theoretical descent of this body of law from the Twelve Tables and the theoretical ascription of the common law to immemorial unwritten tradition were the chief reasons for the difference in the development of the two systems.

The early Teutonic law scarcely recognized individual property. A man might own his spear, his sword, his shield and other weapons of offense or defense; but the *allod*, or domain of each household, was incapable of being disposed of by sale or testament, being strictly reserved to the kindred. Even chattels were regarded as common possessions, the family partaking somewhat of the character of a corporation, of which the *pater-familias* was the trustee, and the members of which were clothed with certain inalienable rights. Under the feudal system a new viewpoint was taken with regard to property in land. The Gothic, Frankish and Saxon chieftains, who conquered the domain of the decadent Roman Empire, parceled out their conquests among their retainers in fiefs. But the land thus distributed was not owned by the person in possession. It was merely held in tenure by way of reward for prospective, as well as past, military service. When the holder of a tenure died or failed in his loyalty the property, which had theoretically remained vested in the sovereign, reverted absolutely to the latter. The succession to land was in the disposition of the overlord, who could demand homage and fealty from the successor as conditions of investiture, and who would also see to it that the latter was a person capable of fulfilling his military obligations. The preference of males in the line of descent and the practical disinheritance of all but the first-born were natural outgrowths of feudal institutions. The privilege of conveying land without regard to these limitations and the view of a will, which regards it as conferring power to divert property as the fancy of the testator may dictate, are not older than the later portion of the Middle Ages. The modification of the strict feudal rules of inheritance in England was an achievement of the courts and lawyers, which was not obtained without conflict with the landed interests represented in Parliament. For instance, where a conveyance or devise of land was made to a person «and his heirs,» the courts held this condition to be satisfied when an heir was born to the grantee or devisee; though the heir might subsequently die, the right to dispose of the land by sale or will was complete. The statute 'De Donis' reversed this rule of the lawyers and declared that in the event of the non-existence of an heir on the demise of the holder of a fee in land the title reverted to the grantor. The feudal law recognized entails, but the lawyers invented the process of «fine and recovery» whereby an entail could be defeated. Finally, by the rule in Shelley's case, the word «heirs» in a conveyance of land was held not to be a word of limitation curtailing the grantee's right of disposition, unless so qualified that another interpretation would necessarily have to be given to it. Another legal fiction, whereby the alienation of estates in land was facilitated, was introduced by the equity jurisdiction. The holder of a fee simple was permitted to create a «use» by conveying the legal title to another, with the understanding that the grantor was to retain an equitable estate therein. The court of chancery would enforce this understanding against the grantee, who held the legal title, and a «use» was capable of testamentary disposition. In the event of intestacy the «use» descended to the heir. Finally Parliament made a statute declaring the beneficiary of a «use» to be the real owner and permitting the disposal of estates in land by will. In this roundabout manner were «tenures» converted into absolute rights of ownership. In theory the holder of a tenure continued to owe homage to his immediate landlord, though by Coke's time the obligation to perform military service as a condition of holding had become in the main a legal fiction. A tenancy in fee was tantamount to ownership, and there were lesser estates, as copyholds, in the creation of which the possibility of the tenant trailing a pike in the service of his liege was never thought of. A copyholder was simply a lessee who paid rent, and a lease had become simply a contract. The provision made by law for the widow was attributable to the exertions of the Church, which achieved one of its greatest triumphs when the express promise exacted from the husband at marriage to endow his wife was converted into a legal right and the principle of «dower» was grafted on the customary law of all western Europe. A milestone in the history of the common law was placed when Thomas Littleton's famous treatise on 'Tenures' was published (about 1481). This work, written in Norman French, was the first really systematic exposition of the English law of real property. It contained not merely a clear and accurate account of the great variety of tenures then known in England, but of the rules with respect to the alienation and inheritance of land, including the law of primogeniture and entailment, as well as the rights incidental to land holding, as easements, or the right to the usufruct. Also the property rights growing out of personal relations between the parties, for instance, a husband's estates by curtesy and a wife's right of dower. Also the absence of rights resulting from a low position in the social order, as, for example, villeinage. Also the law of actions on 'Covenant' and of 'Fine and Recovery.' In fact, for a community which was just emerging from the feudal stage of organization, and in which land alone was, literally speaking, considered *real* property, the law of tenures contained a practically complete system of rules for the governance of society in its ordinary civil relations. It was this that moved Camden, in his 'Britannica,' to speak of Littleton as "the famous lawyer, to whose 'Treatise on Tenures' the students of common law are no less beholden than are the civilians to Justinian's Institutes." Coke called the book "the ornament of the common law, the most absolute and perfect work that ever was written in any human science"— and, when he had drowned the original rivulet of text in an inky flood of commentary, he put forth the product (in 1628) as the 'First Institute of the Law of England.' In this form the work for nearly two centuries remained an authoritative textbook on the common law and, though now almost wholly obsolete, it still has undeniable historic value.

The legislative or statutory contributions to the common law have been massive in quantity and of transcendent importance in their subject matter. It is impossible to even mention more than a few, which stand out above the rest in the formative influence they have exerted. The statutes of Mortmain and Charitable Uses were designed to prevent perpetuities. They marked the growth of the right to alienate land and the gradual undermining of the feudal system. Frequent additions and amendments were required to overcome the ingenuity exercised by the lawyers to evade the statutes against the formation of ecclesiastical and other latifundia. Of equal importance, though in a quite different direction, was the Statute of Frauds. A distant progenitor of this was the provision of Magna Carta which required *secta* (witness proofs) for parol debts, and set a limit to contentious and vexatious litigation by forbidding suit for such debts except within the traditional limits of the *secta*. The statute of Charles II (1677) for the Prevention of Frauds and Perjuries requires written instruments as proof in many classes of contracts and in all contracts not to be performed within a year. The imperfection and danger of oral testimony as proof of past transactions make this one of the most salutary legislative measures in English jurisprudence. The Statute of Limitations, passed during the reign of James I, should also be mentioned. The barring of stale claims from litigation after long lapse of years, when oral and other evidence concerning the transaction was no longer procurable, is the only effective means of quieting titles and assuring the members of society from provocative interference with other long enjoyed rights and promoting the peace. Other sources of the common law, which may here be conveniently mentioned, are the charters granted to municipalities and trading companies, many of the "liberties" granted in these having become general rules of law. The "Law Merchant" was a body of usages common to traders in all parts of Europe relating mainly, of course, to mercantile transactions. The law was laid down by the merchants themselves. The traders of the later Middle Ages were cosmopolites and their established customs and legal rules were observed by all alike, irrespective of nationality. The law was administered by special tribunals — in England by the Courts of Staple and Piepowder Courts. It was administered as distinct from the Common Law even after Coke, in whose time the ordinary law courts had begun to take jurisdiction of controversies between traders. The customs had to be proved as facts in each case. During the presidency of Lord Mansfield over the King's Bench, the Law Merchant was finally incorporated with the common law (see COMMERCIAL LAW). Finally, the equity jurisdiction assumed by the lord chancellors at an early date, and continually broadened, wielded a tremendous influence on the matter, form and practice of the common law; more particularly with regard to women, children and other persons of imperfect legal capacity. This department of law reached its full development in the 18th century under Lord Eldon (see EQUITY). The laws of marriage and the family, of consanguinity and testamentary succession had their origin in the civil and canon law and until modern times (in England) they were administered by the ecclesiastical courts. The title "Surrogate," quite common in the United States, was originally that of the officer who presided over the probate of wills in the Ordinary's Court.

In the domain of constitutional rights the common law has drawn its tenets from a variety of sources; but all of them are purely English. The right of freemen to representation in their own government is traditional, and the Saxon "witenagemots" and Norse "folke things" were the prototypes of Parliament and Congress and all other later legislative assemblies. Immemorial usage also is the basis of the right to trial by jury, though this is also confirmed by Magna Carta. The English Bills of Rights, as their names import, were acts of Parliament, though in America they have generally been embodied in written constitutions, State and Federal. The independence of the judiciary of royal prerogative and the answerability of judges to God and their own conscience, and to no other authority whatsoever, were pronounced in a defi of King James I by Lord Chief Justice Coke. The latter also anticipated the United States Supreme Court by nearly 200 years in passing upon the constitutionality of statutes, saying that "the common law doth control acts of Parliament and adjudge them void when against common right and reason." The fiction that English sovereigns rule by divine right was shattered at least four times, when reigning monarchs were deposed and it was shown that kings in England ruled only by grace of the law and of Parliament. This was the complexity of political liberties and public and private rights, known as the common law, which the English colonists carried with them to America as a cherished heritage. It may suffer in the estimation of precisians because of its lack of form; its nomenclature, as has been truly said, is "a mosaic of many languages" — and the law itself, "except so far as it has been deduced with much logical punctiliousness from the theory of feudal tenure," is little more than a collection of rules strung together on a slender thread of analogy, through which the practitioner must be content to find his way by the help of indices, abridgments or so-called "Digests" arranged in alphabetical order. On the other hand the case against the embodiment of the law in a code, where the rules would be restated in *the language of the codifier*, is a strong one. A code, being inflexible in its character, prevents true growth in the law. Discussions in court would turn on the interpretation of *words* employed in the codification instead of the examination of legal principles. Moreover, an uncodified system of law can be mastered by the student whose scientific equipment enables him to cut his own path through the tangled growth of enactment and precedent and, so, to codify for his own purposes. The common law as it existed at the time of the Declaration of Independence, including the acts of Parliament in so far as they were not repugnant to the rights and liberties contained in their respective constitutions, was formally adopted in all the original States of the Union and by most of the commonwealths subsequently admitted as States. Louisiana, where the 'Code Napoleon' prevailed at the time of its admission to statehood, is an exception. Feudal tenures, the right of primogeniture and entails were abolished in all the original States, and were never recognized by the common law in America. Though the Constitution of the United States in no words adopts the common law, its provisions no less recognize the existence and continuance thereof as the law of the States, with which the national government might not interfere. But even statutes are to be construed with reference to the common law, for it is not to be presumed that the legislature intended to make any innovation upon the common law further than the case absolutely required. This rule of construction has been held applicable to acts of Congress. The Federal courts have no jurisdiction over common law crimes; however, in the trial of actions between citizens of different States involving ordinary legal rights these courts necessarily take cognizance of the laws of the States and of the principles of the common law governing the cases thus brought before them. The Constitution of the United States, together with foreign treaties and acts of Congress made under its authority, are the supreme law of the land. In the States their constitutions, statutes and the common law rank in authority in the order given. When the American colonies had achieved their independence Blackstone's 'Commentaries on the Laws of England,' which Horne Tooke called "a good gentleman's law-book, clear but not deep," had not long been off the press. In it the emphasis is still laid on the rights pertaining to land ownership though, under the titles "Rights of Persons," "Rights of Things" and "Private Wrongs," he classified, not very scientifically, the law of possession and ownership, contract and succession to property by sale, assignment or inheritance, and the law of trespass, negligence and fraud. Bentham criticised the commentators' overstrained, courtly praise of his subject and the obscurity and confusion of his fundamental ideas with irresistible point and vigor and a racy sense of humor. Admitting all these defects, the fact remains that "Blackstone first rescued the common law from chaos and did exceedingly well, for the end of the 18th century, what Coke tried to do, and did exceedingly ill 150 years before." He gave an account of the law as a whole capable of being studied, not only without disgust, but with interest and profit. Another rich mine of the common law was laid open to the young American commonwealth in the decisions of Lord Mansfield, who during his 30 years' incumbency of the office of Chief Justice of England (1756-88) reduced the mercantile law to a systematic and harmonious form. The rise of the United States early in the 19th century to the position of a maritime power second only to Great Britain, and the long-continued state of war on the high seas during that period, naturally produced litigation pertaining to shipping and commerce. Accordingly, the early American law reports are noteworthy for the large proportion of judicial opinions they contain on bills of exchange, bills of affreightment, charter party and, particularly, marine insurance. Little was left for succeeding courts to add to the law on the last named topic. The growth of trade and industry made a form of association desirable, to which many could subscribe capital, with liability limited to the amount of their subscription; therefore, the adaptation to the requirements of manufacturing, trading and other business enterprises of the corporation, which had theretofore served mainly for the administration of charitable, ecclesiastical and educational foundations, of municipalities and such politico-commercial entities as the East India Company. The institution and development of the business corporation are to be counted among the great achievements of American jurisprudence. The partial emancipation of married women from the disabilities of coverture was begun by legislative enactments in the States in the 40's of the last century. In the systematization or codification of the substantive law no great progress has been made in the United States. The law on such topics as negotiable instruments, bills of lading and sales has been reduced to the form of proposed statutes, which have been recommended to the States for adoption — and the first mentioned has been almost unanimously adopted, so that the law on this subject is practically uniform throughout the country. New York led the way in the codification of the rules of civil procedure, with incidental simplification and the abolition of the distinction between common law and equity pleadings. The example has been pretty generally followed and the penal law and criminal procedure have likewise been codified in many States. See COMMERCIAL LAW; CRIMINAL LAW; EQUITY; FAMILY LAW; HUSBAND AND WIFE; JURISPRUDENCE; MARITIME LAW.

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STEPHEN PFEIL.

COMMON LIFE, Brethren of the, or THE COMMON LOT, a religious institute founded about 1376 by Geert or Gerhart Groot at Deventer in the Low Countries. Groot on a visit to the noted mystic Ruysbroek was so impressed by the spectacle of peace and joyful co-operation shown in the community of Austin friars over which Ruysbroek presided that he resolved to form a society embracing both clerics and laymen who, without taking the monastic vows, should lead an austere Christian life in common. One of the aims of the brotherhood was to conduct schools for the religious and moral education of children, and their labors in that field were so successful and so highly appreciated that their school at Hertogenbosch had 1,200 pupils and another school even a larger number. Establishments of the brotherhood were founded in Italy, Sicily and Portugal, and in 1430 there were in existence 130 societies of the institute. At the same time there was formed a similar institute for women: here the superior of each society was styled the Martha. Among the eminent characters who were members of the brotherhood or alumni of their schools were Thomas à Kempis, Nicolaus Cusanus and Erasmus. Many of the «obscurantist» letters in the 'Epistolæ Obscurorum Virorum' purported to be written by members of the Deventer Brotherhood, who are made to appear as irredeemable blockheads.

COMMON METRE, a term used in psalmody to indicate a special form of iambic stanza, consisting generally of four lines, with eight and six syllables alternately to the line. It received its name because it was actually the «common metre» in use in the metrical version of the psalms. Common long metre, in psalmody, consists of a six-line stanza, combining a common-metre stanza with half a long-metre stanza; while common particular meter, consisting also of a six-line stanza, has six syllables in the third and sixth lines and eight syllables in the remaining lines.

COMMON PLEAS, Court of. See COURT.

COMMON PRAYER, Book of. See BOOK OF COMMON PRAYER.

COMMON RECOVERY is, in law, a collection suit instituted by the intended grantee of land against the intended grantor in which the land is suffered to be recovered by the grantee. This device, which was once in common use to avoid legal restraint on alienation by conveyance, is now gone out of use, as additional provisions of the law have made its employment impracticable.

COMMON SCHOOLS, schools for the common people or the people in general. It is only in modern times that education has spread to the masses. In ancient times education was generally confined to a limited class and it was only after the Reformation that common schools came into being. At first they were under ecclesiastical direction, but were gradually secularized and placed under the control of the state. Most of the American colonies established common schools and by 1825–50 the free school system developed. Since then the system has extended to all the States and the scheme of instruction has been greatly enlarged. In the United States, therefore, the term means schools to which all persons within certain ages, except criminals and those with contagious diseases, may attend and implies, moreover, that such schools are supported and controlled by the people and charge no tuition. At first the term was confined to elementary and secondary schools, but there is a growing tendency to include in the common schools of the United States all grades and degrees from the kindergarten to the university. There were in 1917 enrolled in the elementary and secondary common schools 19,153,786 persons or 73.66 per cent of the school population. The average daily attendance in the same year was 14,216,459 or 74.2 per cent of the pupils enrolled. There are 580,058 teachers employed in the common schools, of which number 19.8 per cent are males. The average monthly salary of teachers was $66.07, and the estimated value of all public property used for school purposes was $1,444,666,859. A total of $555,077,146 was expended on the common schools, or $5.62 per capita of total population and at a cost of $39.04 per capita of average attendance. The common school system in general use in the United States has been extended into Porto Rico, Hawaii and the Philippine Islands. Cuba has adopted the same system. See EDUCATION, HISTORY OF; EDUCATION IN THE UNITED STATES; EDUCATION, ELEMENTARY, SECONDARY, etc. See also PUBLIC SCHOOLS; PARISH SCHOOLS.

COMMON SENSE, the philosophy of the so-called Scotch school of philosophy founded by Thomas Reid (1710–96), who aimed to establish a series of fundamental truths indisputable as primitive facts of consciousness. He taught that the general consent of mankind as to the existence of an external world, as to the difference between substance and qualities, between thought and the mind that thinks, is sufficient to establish the reality of a permanent world apart from ourselves; and he maintained that sensations are not the objects of our perception, but signs which introduce us to the knowledge of real objects. The name is applied in colloquial language to that power of mind which arrives at correct conclusions, even if the thinker has no knowledge of laws of thought.

COMMON-TIME, time with two beats in a bar or any multiple of two beats in a bar. The beats may be of the value of any note or rest or compound of notes and rests, providing the sum required by the time sign be exactly contained in each bar. Common-time is of two kinds, simple and compound. Simple common-time is that which includes four beats in a bar, or any division of that number, or square of the number of the divisions. The signs used to express simple common-time are the following: $\frac{2}{1}$, $\frac{2}{2}$, $\frac{2}{4}$, $\frac{4}{4}$, $\frac{4}{8}$, and the characters C and 𝄵. In these signs the upper figure denotes the quantity of notes required in the bar, and the lower figure the quality of the notes. Compound common-time is expressed by the signs $\frac{6}{4}$, $\frac{6}{8}$, $\frac{12}{8}$, such signs meaning two or four beats of three crotchets or quavers to each beat.

COMMONS, John Rogers, American economist: b. Hollandsburg, Ohio, 13 Oct. 1862. He was graduated at Oberlin College with the degree of A.B. in 1888, and received the degree of LL.D. from the same institution in 1915. He studied at Johns Hopkins University 1888–90 and became professor of economics and sociology at Oberlin College 1891, at Indiana University 1892–95, Syracuse University 1895–99, and at the University of Wisconsin since 1904. He was director of the Bureau of Economic Research 1899–1901, and is director of the American Bureau of Industrial Research since 1904. He was investigator for the United States Industrial Commission 1901–02. In 1911 he was appointed a member of the Wisconsin Industrial Commission; and in 1913 he published a report of the work of the Milwaukee Bureau of Economy and Efficiency. He is the author of articles on wealth, labor, representation, etc., in scientific and other journals, and of 'The Distribution of Wealth' (1893); 'Social Reform and the Church' (1894); 'Proportional Representation' (1895, rev. 1907); 'Trade Unionism and Labor Problems' (1905); 'Races and Immigrants in America' (1907); 'Labor and Administration' (1913); 'Labor Legislation' (with John B. Andrews, 1916). He edited 'Restriction of Output by Employers and Employees' (the 7th special report of the United States Commissioner of Labor, 1904). He was also one of the editors of 'A Documentary History of American Industrial Society' (1910); 'History of Labor in the United States' (1917); and wrote 'Principles of Labor Legislation' (with John Andrews, 1917).

COMMONS. The commons of Great Britain, in a general sense regarded as comprising all such men in the kingdom as had not seats in the House of Lords, and every one of whom had a voice in Parliament, either personally or by his representatives. With women now (1917) enrolled in the parliamentary franchise, the Commons must be regarded as including both sexes. Commons in Parliament is the lower House, the third estate of the realm, and consist of representatives elected by the counties or divisions of counties, and by the cities and boroughs. In the election of representatives anciently all the people had votes; but in the 8th and 10th of King Henry VI, for avoiding tumults, it was enacted that in counties none should vote but such as were freeholders, did reside in the county, and had 40s yearly revenue, equivalent to nearly £20 a year of the present money; the persons elected for counties to be *milites notabiles,* at least esquires or gentlemen fit for knighthood; native Englishmen, or at least naturalized, and 21 years of age; no judge, sheriff or ecclesiastical person to sit in the House for county, city or borough. The House of Commons, in Fortescue's time, who wrote during the reign of Henry VI, consisted of upward of 300 members: in Sir Edward Coke's time their number amounted to 493. At the time of the union with Scotland, in 1707, there were 513 members for England and Wales, to which 45 representatives for Scotland were added; so that the whole number of members amounted to 558. In consequence of the union with Ireland, in 1801, 100 members were added for that country; and the whole House of Commons therefore consisted of 658 members. By the reform bill of 1832 the number of members was altered as follows: 500 for England and Wales, 53 for Scotland and 105 for Ireland. The reform acts of 1867 and 1868 introduced a further alteration, the numbers being 493 for England and Wales, 60 for Scotland and 105 for Ireland; by the act of 1885 they became respectively 495, 72 and 103. See PARLIAMENT; GREAT BRITAIN — PARLIAMENT.

COMMONWEALTH, the state or prosperity of a country without any reference to the form of government under which it may be at the time. Owing to the semi-independent position of the States of the American Union the term commonwealth is of frequent application to the various members of the great Federal government, which itself is spoken of as the National or Federal Commonwealth in contradistinction from its constituent autonomies. In many of the States the legal proceedings against criminals, etc., are instituted in the name of the (for example) «Commonwealth of ——— *v.* John Doe.»

The word is also applied to the period in the history of England during which the parliamentary army and the Protector, Oliver Cromwell, exercised the power of government. King Charles I was beheaded on 30 Jan. 1649; but if the beginning of the commonwealth be deferred to the time when Oliver Cromwell became Protector, then its beginning was not till 16 Dec. 1653. It received an all but fatal blow by the death of its great chief, 3 Sept. 1658. On 22 April 1659, Richard Cromwell, his incompetent son and successor, resigned, and on 29 May 1660, Charles II was restored to the throne. The Commonwealth of Australia, embracing the states of New South Wales, Victoria, Queensland, South Australia, West Australia and Tasmania, was established by act of Parliament passed 9 July 1900, and proclaimed at Sydney, 1 Jan. 1901.

COMMUNALISM, the theory of government by communes or corporations of towns and districts, adopted by the advanced republicans of France and elsewhere. The doctrine is that every commune, or at least every important city commune, as Paris, Marseilles, Lyons, etc., should be a kind of independent state in itself, and France merely a federation of such states. This system must not be confounded with «Communism» (q.v.), with which, however, it is naturally and historically allied, though the two are perfectly distinct in principle.

COMMUNE, kŏm'mūn, the unit or lowest division in the administration of France, corresponding in the rural districts to the English parish or township, and in towns to the English municipality. In France there are about 36,000 communes, with a considerable measure of self-government, with the power of holding property, etc. Each commune has a council elected by universal suffrage, and the council is presided over by a *maire* and one or more *adjoints* or assistants. In the larger communes the *maire* is selected by the central government out of the members of the council; in others he is appointed by the prefect of the department. The central government, through its officials, exercises generally a very large control over the affairs of the commune.

The rising of the Commune of Paris in 1871 should not be confounded with «Communism» (q.v.). It was a revolutionary assertion of the autonomy of Paris; that is, of the right of self-government through its commune or municipality. The theory of the rising was that every commune should have a real autonomy, the central government being merely a federation of communes. The movement was based on discontent at Paris, where the people found themselves in possession of arms after the siege of the Germans. The rising began on 18 March 1871, and was only suppressed 10 weeks later after long and bloody fighting between the forces of the commune and a large army of the central government; 6,500 Communists having fallen during 20–30 May, and 38,578 being taken prisoners. Consult Du Camp, ‹Les convulsions de Paris› (4 vols., Paris 1878–79); Lessagaray, ‹Histoire de la Commune› (Paris 1896); March, ‹History of the Commune of 1871› (London 1896).

COMMUNICATIO, kŏm-mū-nē-kā'shĭ-o, or **COMMUNIO, Idiomatum,** ĭd-ĭ-ō-mā'tŭm, a term or phrase hardly capable of translation into English, which is used to signify the appropriation mutually of divine attributes to Christ as man, and of human attributes or human affections to Christ as God because of the hypostatic union of the divine nature and the human nature in Christ; thus, we say «God died for us,» and the mother of Jesus is *theotokos, deipara,* mother of God. *Idioma,* plur. *idiomata,* is Greek equivalent to Latin *proprietas,* and means that which belongs to one, an attribute. The theological phrase in Greek is *antidosis idiomaton.*

COMMUNION, the reception of the Eucharist. In the Roman Catholic Church the Eucharist is administered to the faithful only in one kind, the species of bread. Only the priest who performs the act of consecration receives the sacrament in both kinds. In the Protestant churches the laity receive the sacrament in both kinds, and the usage of the Greek and Oriental churches is the same. The withholding of the cup from the laity was not required by the laws of the Latin Church till the Council of Constance ordered it in 1414, though by that time usage had made it an almost universal custom. Yet down to the 11th century communion under both species was universal, and as late as the middle of the 13th century Saint Thomas Aquinas notes the communion under one kind as the usage only of «some churches.» As it is purely a Church regulation, the Church can and does dispense from it, or the Church can abrogate it and bring back the original usage of communion in both kinds. Even in the earliest times communion under one kind was the rule when the sacrament was to be administered to the sick and infirm in their homes; in that case the one kind was under the species of bread, but in the same early period it was customary to administer the Eucharist to infants immediately after baptism, but only under the one species of wine. See LORD'S SUPPER.

COMMUNISM. Although aiming at the abolition of private property, communism must not be understood as including at all times an equal division of all property. In its limited application it may mean the common management of industry and the sharing of the fruits of some of these in common. Socialism is not communism, though some socialistic schools are communistic, that of Edward Bellamy's ‹Looking Backward› being purely so.

Communism, or the sharing of things in common, is, in a limited form, practised by every civilized community. There is to-day common management of parks, schools and other utilities, and practical communism in water, which is supplied free to the poorest inhabitant of our cities. In the case of commodities which are plentiful and cheap, as, for example, matches, there is a kind of communism prevailing among individuals. But perfect communism as a social theory finds few adherents, and practical experiments in the past in such directions have been, save for limited periods, unsuccessful. Even where the communism of certain societies or settlements has succeeded temporarily it has done so largely by their trading with or manufacturing for the greater world of capital and labor that touches them from without. Few of such communities that have remained entirely isolated have attained even a measurable degree of success.

Communism in the Christian Church.— It is not too much to say that in primitive times property was in common, and that individual ownership arose as a natural development out of communism. The Cretans and the Spartans possessed communistic societies, and there seems to be little doubt that communism as a supernatural ideal was practised among the early Christians. That it was successful for a time in the primitive state of society then prevailing among the disciples of Jesus also seems highly probable. The communistic societies that have since been formed have been successful in the measure of religious devotion that inspired sacrifice, and have declined as this religious ardor subsided or became corrupted by other elements. But whatever their temporary success may have been among the early Christians, the experiments were soon utterly abandoned, and the principle of individual ownership of property finally and fully asserted itself. That even the early Christians adopted without qualification the theory of communism may be doubted. Certainly authorities are disagreed, so that even here we are without the necessary data to conclude that perfect communism was temporarily successful. During the Middle Ages many of the religious orders, notably those that strove to preserve the apostolic simplicity of the early Church, the Franciscans, the Brothers of the Common Lot and others, taught and practised communism.

Communism in the United States.— *Fourierism.*—The communities that have been formed in the United States, mostly in New England and the West, have nearly all died out, or exist in a moribund condition. We need not speculate upon the reasons, though it would seem that the desire of individual ownership, with the incentive to action which such ownership inspires, is indestructible and therefore fatal to perfect communism. The most famous of all American communistic or semi-communistic societies that arose as a result of the teachings of Charles Fourier (q.v.), was that of Brook Farm (q.v.) because of the intellectual and literary eminence of its founders. Horace Greeley (q.v.) was a warm friend of the Fourierite movement from the first, advocated it powerfully in the New York *Tribune* and was vice-president of the North American Phalanx, in Monmouth County, N. J., one of the most successful of the Fourierite communities, for it lasted over 12 years, dying in 1856. It was intended as the model of its kind, and at the beginning it prospered. Perhaps no similar movement has ever received anything like the influential support accorded to Fourierism. The teachings of this remarkable man, the insight and value of much that he wrote, as well as the warmth that suffused his prophecies, enlisted the enthusiasm and aid of some of the most eminent men of the time. But feuds and disharmony set in, and slowly the movement began to disintegrate. The noble dreams of Fourierism were either founded upon mistaken generalizations, or were too early anticipations of the industrial and social development of mankind. It was only at a late period of its career that Brook Farm came to be modeled on the Fourier plan, and its simple life became perhaps too systematized. Work was in common, and at the most menial occupations men who became the glory of American letters, and women of the highest New England culture, cheerfully took their turns. But with the ebbing of the tide of Fourierism the Brook Farm experiment came to an end. The North American Phalanx outlived it for a short period; but with the death of that settlement a movement which embodied one of the most pretentious and sweeping philosophies of social regeneration perished from the American continent. Fourierism, which in France had died for lack of funds, had received in America as fair and adequate a trial as was ever accorded to any mooted social reform. For years its disciples had taught and experimented, only to end with failure. When the New York *Tribune* abandoned its advocacy it ceased even to be a topic of general discussion, and in 1856 came its final collapse.

New Harmony.— In connection with early attempts in the last century to found communistic settlements in this country the name of Robert Owen (q.v.) is conspicuous. This English manufacturer, an enthusiastic communist, having seen his efforts in Great Britain fail of fruition, visited this country and founded a number of communities, the best known of which was that of New Harmony, Ind. Most of the others were short-lived, and that of New Harmony, born in 1825, expired in 1827.

The Shakers.— Among the communities that owe their origin to religious fervor, and which still survive at Mount Lebanon, N. Y.; Union Village, Ohio; Watervliet, N. Y.; and elsewhere are those of the Shakers (q.v.). Their founder, Ann Lee (q.v.), landed in New York in 1774, with eight followers from England. They had fled to escape the persecution which had followed her bold assertion of divine revelation. The Shakers are celibates, and thus their communities have not grown very rapidly, yet 15 are said to exist to-day.

Oneida Community.— The Oneida Community, another of the very few survivals of that communistic spirit which swept over the country in the middle forties, was established in 1848. It ignored the regulation of marriage, founding the union of the sexes purely on the mutual consent of the man and woman. It was because of this that the Oneida Community fell into evil repute, and this reputation extended in many cases to communities less deserving of the stigma. The union of one man with one woman the community expressly discouraged as an «exclusive and idolatrous attachment.» When a man and woman were brought together, and showed a tendency to «fall in love,» everything was done by the society to discourage such relationship, even to the extent of forcing them apart by publicly expressed condemnation. A more extraordinary view of sex relationship has probably never suggested itself among all the confused and eccentric beliefs of mankind. The Oneida Community was founded by John Humphrey Noyes, in Madison County, N. Y. They practised communism and a change of occupation (a Fourierite principle). They have, it is said, forbidden the admission of new members.

Harmony Society.— The Harmony Society, which was succeeded in 1825 by New Harmony, Robert Owen having purchased the land of that settlement from George Rapp (q.v.) and his followers, was a notable experiment. Rapp's notions were queer enough, but he had great influence with his followers, who regarded him as possessed of supernatural powers. They practised communism and celibacy from 1805, the date of the founding of the community in Butler County, Pa., where they remained until 1814, when they changed their location to the Wabash Valley. Here the settlement flourished until the purchase of the lands by Robert Owen.

Amana Community.— The Amana Community, still surviving, was formed in 1842 by emigrants from Germany and Switzerland, who originally belonged to the peasant class. They settled in New York State, near Buffalo, and later removed to Iowa. They were spiritualists who regarded themselves as the subjects of special revelation. This religio-communistic settlement is probably the earliest in origin in this country, for it traces the beginnings of its creed as far back as the early part of the 18th century. Their rules of life are rigid and forbidding; amusements are prohibited; and much that ministers to innocent pleasure is banished as sinful.

The Icarian Community.— To mention even the names of all the communities that exist or have existed in the United States would take more space than can be given to the subject. The appended bibliography will guide to all the information of which the reader may be in search. But special mention ought not to be omitted of the Icarian Community, remarkable as owing its origin to a book, ‹A Voyage to Icaria,› by Etienne Cabot (born 1788), who had been a member of the French legislature and a leader of the Carbonari. He sailed in 1848 with a number of his followers from France, and established the community in Illinois in accordance with the ideas contained in his work. They numbered as many as 1,500 at one time. Later they were compelled to seek other settlement in Iowa. This community was peculiar in that it came nearer to the ideal of democratic communism; the rigid regulations of other communities were absent, the point aimed at being to let every one do as he pleased.

A settlement in which no community of property save that of land obtains, and in which the government is nearly as purely democratic, is that of Fairhope, Ala., founded a few years ago by a handful of disciples of Henry George. It is organized as a corporation, by which its real estate is administered. The annual value of the land is taken for communal purposes. It numbers about 300 members, and up to the present time is prosperous.

Significance of Communism.—All these experiments which have been reviewed have failed to demonstrate the feasibility of communal life. Existence within its confines is, for the most part, meagre and unsatisfying. Though these communities sometimes grow rich, progress in its finer sense there is none; they do not rise in culture and intelligence above their original level. Yet some things they have demonstrated, among which are the possibilities of a more peaceful industry, more unselfish lives, together with a fuller leisure, and freedom from the harassing fear of want. Abnormal as they seem, they are really protests against what in our civilization is abnormal. Clothed, as the most successful of them are, in religious guise, the fact that they are impulses, even when most eccentric, of the more profound and imperishable nature of man, is vastly significant.

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JOSEPH DANA MILLER.

COMMUNISTIC SOCIETIES. See COMMUNISM.

COMMUNITY CHRISTMAS TREE MOVEMENT. The Community Christmas Tree Movement, which was initiated in New York with festivities for the children at Madison Square, in 1912, has very rapidly developed in popularity. The tree is lit from Christmas Eve till the midnight of 31 December, when thousands of children welcome in the New Year with music. Even before 1912, at San Francisco, the public singing of carols led by Madame Schumann-Heink and other distinguished artists was an eagerly watched event. Other cities all over the land have promoted the Christmas tree celebrations. The American Pageant Association Bulletin 41, 15 Oct. 1916, entitled "Some Suggestions for Community Christmas Celebrations," gives lists of Christmas mysteries and plays and music with much other valuable information. Bulletin No. 42, 15 Nov. 1916, "The Possibilities of the Christmas Masque," by William Chauncey Langdon, should also be consulted.

COMMUNITY DRAMA, or CIVIC DRAMA. This is a term that has recently sprung into widespread use to embrace various kinds of performances, generally more or less dramatic in form, but sometimes merely processional and picturesque, presented by large bodies of people (marching, singing, dancing, acting and so forth) in co-operation with writers, designers and others. The differences in kind are denoted by the use of the names: pageant, masque, festival; and, somewhat loosely, the rural play, the school play and the outdoor play. Mr. William Chauncey Langdon, the well-known pageant master, has cleared away much of the difficulty of classification by pointing out that the essential characteristics of these forms may be differentiated as follows: The pageant is historical; the masque is philosophical; the outdoor drama like the regular drama is individual; and all these are objective in their character. On the other hand, while the festival is lyrical, it is subjective in character. The school play is educational and subjective. These forms are all treated separately under special headings.

The history of the community festival, all that may be written with reasonable certainty, covers the long stretches of the past, under many a ritual, back to the immemorial religious cults. There can be little doubt that all theatres had their rude beginnings when human beings first began to dwell together in communities, and to hunt, feast, play and worship in common. For a fuller account of the primitive drama consult Grosse, E., 'Beginnings of Art,' and Frazer, J. G., 'The Golden Bough.' Mr. L. Havemeyer's 'The Drama of Savage Peoples' (Yale 1916) contains the new material in accessible form. The first chapter of Prof. Brander Matthews' 'Development of the Drama' gives an excellent summary of the broad facts.

The archetype of the Greek theatre itself, the apex and crown of all primæval culture, may be seen in active existence at the present day in the islands of Melanesia. There, in the rustic dancing circle, we have a perfect example of the Greek orchestra, *in embryo;* and in the little robing hut of these simple islanders of the south seas we are in at the birth of the magnificent Skene of the theatre of Athens; the word *skene* originally meaning a booth or tent, and then a stage, projecting our English word scene. These two extreme cases of the Greek theatre and the Melanesian circle provide us with exemplars of sites as suitable to-day as ever for either the community drama or festival.

In mediæval times, when first the Church and later the guilds and schools encouraged and assisted in the performances of the mystery and morality plays, all that existed by way of a theatre was distinctly communal. The passion plays, still performed in Oberammergau, Bavaria, and in Selsach, Switzerland, and elsewhere, are survivals of the mysteries and miracles of the old communities. In the spreading liturgy of the mediæval Church we mark the beginnings of the long slow rise toward the compact drama of the most modern playwright. Following the ecclesiastical period of play-making and play-going and entering upon the secular period of folk drama, the culmination was reached in the works of members of the trade guilds, of whom the wise old cobbler Hans Sachs (1494–1576), and merry John Heywood (1497–1590), are the classic types. Thereafter came the development of the regular theatre and the narrowing down of the expression of the dramatic instinct of the folk to the usual calendar festivals, games, etc., described with droll particularity in such compilations as Chambers' ‘Book of Days.’ In the 19th century, with the growth of machinery and the new industrialism, when men discussed the humanities more than they practised humanity, men and women and children, too, well-nigh forgot even these simple festive joys of the open air. They, however, remained in literature and in tradition for a new and more democratic practice in this present century.

«The civic theatre idea, as a distinctive issue, implies the conscious awakening of a people to self-government in the activities of its leisure. To this end, organization of the arts of the theatre, participation by the people in these arts (not mere spectatorship), a new resulting technique, leadership by means of a permanent staff of artists (not of merchants in art), elimination of private profit by endowment and public support, dedication in service to the whole community; these are chief among its essentials, and these imply a new and nobler scope for the art of the theatre itself.» Mr. Percy Mackaye, author of ‘The Civic Theatre’ from which the above lines are taken, deplores the severance of joy from labor under modern commercial conditions, and conceives the one answer to the workers' protests to be in «Art, the recreative labor of leisure.» His favorite phrase, his slogan and the subtitle of his book is, «the redemption of leisure.» To the now swiftly increasing body represented by Mr. Mackaye the reorganization of leisure is not alone a fine aim in itself, but the real goal, the focus, of all the striving of the age, the fulfilment of the deepest instinct of humanity, the need for happiness. In the spirit of his illustrious British prototype, William Morris, he pleads for a theatre endowed as the public schools, universities, churches and libraries are already endowed.

On the other hand, the opponents of the community festival movement, while acknowledging the fine disinterestedness of its leaders, do not recognize any pulsing life in the pageantry of to-day, so far as it relates to America; they deny real interest on the part of the people, and maintain that we have no traditions upon which to found a vital community theatre comparable to the same in Europe. For an able expression of this view, consult «Modern Pageants not Spontaneous» (in ‘The Nation,’ Vol. XCV, p. 245, New York 1912).

The supporters meet these disavowals by reminders of our native Indian, Spanish, French, Colonial and Post-Revolutionary lore, and partly admitting a tincture of artificiality and crudeness incidental to the early stages of the cultivation of the form, point to the amazing growth of the movement among all classes over all the States. Particularly have they sought and found expansion, where alone vitality can be reached in any concern touching the genius of the mass, in the co-operation of the industrial and rural folk, as well as in that of the children. In point of fact no country or district in Europe, or any other part of the world, can show wider or more enthusiastic interest in community drama, especially on the part of the young people and educationists of all grades, than has been demonstrated by the United States. Indeed, in this form of the drama, and in this alone, can the United States show herself more forward than Europe. This holds good not only in respect to organization and scope but also to actual performance. See COLLEGE DRAMATICS; CHILDREN'S THEATRES; FESTIVAL; MASQUES; OUTDOOR THEATRES; PAGEANT; RURAL THEATRES.

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DUNCAN MACDOUGALL.

COMMUNITY MUSIC, a term recently brought into wide currency through the characteristic interests of the day along lines of social administration; and, in general, somewhat loosely embracing both old and new forms of organized musical practice. More strictly, however, it describes the newer, popular expressions of the love of music by way of recreational, ameliorative and educational settlements, as well as through countless neighborhood and municipal centres, both rural and urban, that have had their origin in the peculiar industrial, social and political conditions of recent times; many of these organizations corresponding to the more spontaneous outgrowths of merrymaking in olden days. See FESTIVALS.

In the social consciousness of our day music has come to be regarded as a tremendous force in the well-being of the community,— recreational, educational, moral and spiritual,— whether the people be viewed in their capacity of listeners or performers. Loving the songs and simple melodies they know well, the people are also moved intensely by even the difficult and unfamiliar classics, provided they are played with feeling and intelligence. «Great music greatly performed,» says Professor Dykema, «is able to overleap seemingly impossible barriers of lack of culture; the majestic strains of a Beethoven symphony played by a fine orchestra carrying every listener before them.» Then, much more intense is the influence of music in the case of the active performer, however humble. «In concerted music the social side is carried to its highest point. There are few social forces comparable to the power of a large group of people singing a grand chorus.» The continually rising standards of municipal concerts, the organization of community choruses, Christmas Tree celebrations, pageants and masques with music, school and community orchestras and popular symphony concerts all over the Western World, point to the general hunger for musical expression, more especially in the community sense.

This community movement, many-sided by its inherent nature and unfailingly democratic, sweeping over the greater part of the world, has had a most remarkable success in the United States. Its main sources of influence, both old and new, amateur and professional, are in (1) domestic and industrial circles; (2) schools and colleges; (3) churches; (4) specific musical organizations; (5) places of amusement; and (6) various musical activities; the notes of special interest being gathered under these headings, as follows:

Domestic and Industrial Circles.— No one can fail to make observation of the almost universal distribution of various modern mechanical inventions for the rendering of both instrumental and vocal music; the pianolas, phonographs, etc.— which, while retarding individual technical development in some circles, have in others encouraged group singing and playing to a point of enthusiasm and excellence in districts where the greatest performers of the day would otherwise, in all probability, have remained unheard. This applies most pointedly to a legion of large and small communities of factory, shop, studio, agricultural and other workers, who, till the advent of these new mechanisms, were often musically stranded, both in town and in country, to an extent that is only now being realized. Innumerable industrial groups have from such beginnings organized themselves until their trained bands, choirs, etc., have become of wide importance in musical affairs. Nevertheless it is regrettable that the antique custom of both solo and concerted singing at actual labor has well-nigh passed into oblivion in the greater part of both hemispheres. In America our own aboriginal people, the Indians, to whom song is the very consecration of the spirit of life, rarely undertake even the most menial tasks without an appropriate song. Like all real folk music, the music of the Indian is the spontaneous and most earnest expression of the soul of a people, and of all music the most distinctively American. Old tradition, tribal history, the counsels and warnings of every day, the mighty deeds and sayings of the wise and the brave, the unchallengeable verities, the call to worship and to the feast, all are expressed in the ritual of song and poetry.

Schools and Colleges.— Within the last decade a great change in musical instruction in the schools has resulted from the recognition by educationists throughout the country that music in the schools must be more than another type of disciplinary study; above all, in the insistence by the pedagogic leaders of the movement on the use of better musical material and a larger number of songs before beginning technical drill. They also point out the possibility of cultivating original art power among gifted pupils by allowing scope for individuality, and of developing the more conscious sympathetic aspects of the children's singing by allowing them to take part in musical festivals and concerts for the general community. In most of the larger communities throughout these States it has become customary to hear good music, ranging from simple unison songs, light operas and cantatas to the great oratorios creditably performed in the large auditoriums and parks by the children from the public schools. There are even orchestras and bands in some of the schools. These are able to assist at concerts with choruses of children; and churches, theatres, clubs and private individuals are seeking, and even competing against each other, to unite with the schools. Elgin, Ann Arbor and Dayton have already given remarkable offerings at low prices. Another step in advance has been made by the recognition by the schools of private instruction in music and by granting credit to pupils for work done outside. The public high schools, with the colleges and universities, are also allowing the courses taken with accredited music schools and private instructors to count for admission. A large number of high schools practise chorus singing and maintain musical appreciation classes; and certain of the more progressive offer instruction in the technique of music, in solo-singing and in instrumental work. In Richmond, Ind., for instance, the teacher of public school music was engaged on condition that he devote half time to municipal music. In Wisconsin there is a popular movement to create by law a city social centre where the musical and other recreations of the people may be more compactly and more intelligently controlled than under the present haphazard system, or lack of system. It has been proposed that community directors be appointed from among principals of high schools and officials of like standing, with a definite salary for each office.

Churches.— For a very large proportion of the adult population church music includes practically all the serious music which they are in the way of hearing, and carries the one complete opportunity for chorus singing. A number of churches, recognizing the fact, are dealing with the situation from its many points of view; and some are very wisely opening their doors to good secular work, in the lighter as well as the heavier vein,— operettas, pageants, etc. The American Guild of Organists has nobly responded to the call for wider activity. The church choir is in some districts doing much of the work formerly sustained only by the choral society; these choirs being found to have more influence upon the community than the work of the soloist. A number of churches, both in this country and abroad (as in «America's Musical Shrine» at Bethlehem, Pa., and at Worcester Cathedral, England, where festivals of music have been annual events for nearly 200 years), have generously cultivated the love of song and instrumental music.

Specific Organizations.— Early in the last quarter of the 18th century the Stoughton (Mass.) Musical Society, which still flourishes, was founded by William Billings, a tanner by trade, an eccentric and a music teacher of some genius. This energetic man gave a healthy impulse to popular music that is yet felt. About the same time the excellent Handel Society of New Hampshire was organized; and the year 1807 saw the foundation of the Massachusetts' Musical Society. On 8 Jan. 1792, at Medfield, Mass., the «father of music in America,» Lowell Mason, was born. To him we owe our best ideas in the promotion of music among the masses. He pointed the way to a higher order in church music, introduced music into the public schools, popularized class chorus singing, spread the art of teaching music on the rational inductive plan and established teachers' conventions and institutes. He died in 1872. In various corners of New England musical festivals with large choruses and orchestras, formed from small choral societies of neighboring towns, are held regularly. Two typical instances of these are the concerts at Conobie Lake Park by a chorus of over 300 singers from four nearby towns,— Lowell and Lawrence, Mass., and Manchester and Nashua, N. H.,— under the direction of Eusebius G. Hood; and the Litchfield Country Choral Union at Norfolk, Conn. (originally, in 1897, the Norfolk Glee Club; and united with the Litchfield, Torrington and other local organizations in 1899, with a total membership, in 1914, of 677), conducted by Richmond P. Paine, and promoted and housed by the generosity of Mr. and Mrs. Carl Stoeckel.

Scattered widely over the country, a number of cities and towns of small size have lately come into prominence and have sometimes astonished critics of high standing with their general musical activity, and, particularly, with performances of the 'Messiah,' the 'Creation' and other classic oratorios. Two signal examples are to be found in Bethlehem, Pa., and in Lindsborg, Kan. At Bethlehem, by the admirable patience and perseverance of Mr. J. Wolle, extending over 30 years, a choir has been nursed up to so high a standard that its renditions of Bach are conceded to be the best of any of this kind in America. The annual festivals of our «Pennsylvania Oberammergau» have for years attracted the music lovers of this and other countries. At Lindsborg, a little town with a population of only 2,000, the Bethany Oratorio Society performs Handel's 'Messiah' with a chorus of 500 voices and an orchestra of 40 pieces, during each Easter week. The chorus is more than 30 years old and has given Handel's masterpiece nearly a hundred times; and has, besides, undertaken all the standard oratorios. During the Easter festival the population is increased threefold,— visitors pouring into the centre from far and near.

Places of Amusement.— While the American citizen is a generous spender on concerts and all other forms of musical activity, the status of musical taste and ability is generally admitted to need advancement. Audiences are characterized as being too good natured and too careless of standards. That the leaders of music in our numerous communities are creating a warmer and more spiritual understanding between themselves and their audiences is the most hopeful of all signs. Even in unexpected quarters the people have been shown invariably to follow a good lead. At the New York Rialto Theatre, a vaudeville and motion picture house, music of a high standard was lately tried with such success that the orchestra soon became the chief feature of the performances.

Possibilities in the Ordinary Community. — The signs on the horizon point to the responsibility for the development of community music being in the hands of city governments; though, as yet its progress has been due mainly to private enthusiasm and enterprise. In a number of communities professional musicians during prolonged visits unite the amateur talent of a neighborhood, and with a few imported players produce worthy musical festivals. The results at Meriden, N. H., in the Pageant of 1913, under the musical direction of Mr. Arthur Farwell, and in similar performances of the kind elsewhere, illustrate how well the folk of small country places may be inspired by an occasion to play music of a high grade most acceptably. (See PAGEANTS and COLLEGE DRAMATICS). And the possession of an excellent band or orchestra has proved a possibility for the most unpromising of communities. Most of the great orchestras in large cities are maintained through a guarantee fund by subscribing citizens on a private basis. In one State a bill has recently been passed for the support of a State orchestra that will have a complete and regular circuit. In a number of places throughout the country music, concerts and lectures for adults are part of the educational system. One community extends musical instruction to all who are willing to embrace the offer. In New York, Boston, Rochester and in La Porte, Ind., a special official has been appointed to supervise the city music. In New York three municipal concerts began in the spring of 1910 on a new untried basis under the administration of Mayor Gaynor. There were bands in about 30 of the 150 parks in the city on one evening of the week during summer. Sometimes bands performed on all recreation piers every evening for a season, and sometimes only on three evenings, with afternoon folk-dancing for the children on the piers. In Central Park the crowds were enormous; and at Tottenville, S. I., the farmers and others gathered round in their wagons to listen to the worlds' masterpieces played by an excellent local band that for the first time in 20 years had joined the professional ranks. In many other centres throughout the country bands and orchestras are engaged by the authorities to give free concerts to the people in summer and even in winter. In the State of Wisconsin, any city, town or village is now authorized and empowered to conduct public concerts in parks (to be paid for out of the park funds) and in various kinds of auditoriums (to be paid for in any way that the board, town council or other stated official may determine).

Citizens as Performers.— The highest spiritual point in community music would appear to have been reached in the extension of a welcome to everybody, trained and untrained, to sing in chorus. The wisest heads in the movement rule that in every healthy community there should be opportunity for all people to sing as much as they wish, and that at least one combined function might be held, of an informal sort, and almost without direction. The success that has already attended the carrying out of this principle has been extraordinary. The supervisor of music in the Minneapolis city schools reports that in Anoka, with a population of 3,000, everybody was invited, everything was donated, and over 2,000 more than the whole population of the town arrived to sing 'Home, Sweet Home,' 'Come Thou Almighty King,' 'Suwanee River,' etc. Recently in Minneapolis Park, at a free concert with a chorus of children, no less than 15,000 people attended. But perhaps the most remarkable expression of this kind is found in the Community Chorus movement, an offshoot of the Music School Settlement of New York, that in a very short space of time has taken whole communities by storm. It is essentially democratic and includes all who would meet together for the joy of singing, without voice trials and without dues. Hundreds of community choruses have been formed, and reports of organization and inquiries are entering from every State in the Union. New York, Buffalo and the Oranges (N. J.) have community choruses of over 1,500. Kansas has over 30 community choruses, with the University of Kansas in support of the movement; Wisconsin is carrying out the community music idea in the broadest fashion and has a leader in the University of Wisconsin. Newspapers in New York and everywhere are devoting full columns to accounts of the movement and its affairs. In New York the Community Chorus has sung every week since its organization, 9 Jan. 1916. During the summer seasons its «sings» were held every Sunday afternoon in Central Park with thousands present. It gave the memorable «Song and Light» festival in Central Park, 13–14 Sept. 1916, with over 50,000 citizens taking part; and the effect was so overwhelming that its repetition was peremptorily demanded for the following evening. On 26 Dec. 1916 before an audience of 10,000 Handel's 'Messiah' was given with 1,000 voices (80 per cent of the performers never having heard the work before beginning rehearsals); and in the Hippodrome, 29 April 1917, an audience of 4,500 joined eagerly in the community singing under Mr. Barnhart's direction and responded enthusiastically to the inspiring addresses of Mr. John C. Freund, editor of *Musical America*, and the Hon. Cabot Ward, park commissioner of the city of New York; this performance like all the rest of the chorus being free to the public in every sense. Another spirited organization on somewhat similar but graded and slightly exclusive lines is the People's Choral Union of New York, with from 600 to 1,200 members creditably performing the great oratorios and large choral works, organized by Dr. Frank Damrosch. The «Frank Damrosch of Boston» is Mr. Samuel W. Cole, who, as early as 1897, conducted free choral classes for the people of Boston. In Chicago the «musical evenings,» instituted by Mr. Arnold Dresden of Chicago University, and promoted by the Women's Trade Union League, gained the hearty co-operation of the park commissioners and have proved eminently successful.

Beyond the large choral clubs there are the smaller organizations; such as the Frauenchor and Maennerchor of the German communities in the United States, and the various types of choirs in the communities of Wales and other countries. The enormous extent of musical activity possible in a community is indicated by the numerous competitive musical festivals of Europe. Blackpool, England, for example, has such a festival with about 5,000 competitors from all over England entering 64 types of contests, including choruses of 60 voices and all variations of fewer numbers for men or women or both men and women, down to solo.

In the United States the closest resemblance to such festivals is found in the Saengerfest and the Eisteddfod. At a recent Welsh celebration in Pittsburgh by Cambro-Americans the chief interest was music, although there were competitions in other arts. The choirs came from the mills, mines and factories for the most part. For Christmas and other festivals by various sorts of communities, see FESTIVALS.

Instrumental Music.— There are many nurseries of instrumental music scattered over the great cities of the world, but perhaps the most significant of them all is the Music School Settlement on the East Side of New York. In 1917 there were 1,100 enrolled pupils, as well as an «outside» department and a very long waiting list, with a staff of 100 teachers. There are four orchestras, aggregating 200 players, a wind instrument department, a musical bureau which secured over 300 paid engagements for pupils in 1916, a library of 2,500 readers, an instrument department with 100 instruments for the use of pupils, lectures, concerts, festivals and plays. There is a social centre in charge of a head resident and her assistants who manage the various clubs, etc., and help the music teachers in the effort to develop the children physically, mentally and morally. There are 15 nationalities represented; and the terms to pupils run from 50 cents for an individual lesson to 10 cents for a class lesson. A limited number of scholarships are provided for talented pupils who cannot pay these fees. The Maidstone movement in England is of the same type.

The National Union of School Orchestras, London, was founded in 1905, giving its first performance at the Crystal Palace with 700 girl and boy violinists, with such success that in 1914 the performance at the Crystal Palace was given by 6,800 children. But even these figures represent but a small fraction of violin-playing children over the kingdom; for with 5,000 schools having orchestras already formed there are at least 200,000 children who are members or adherents of the Union. There are scholarships which entitle the winners to advanced instruction at the Guildhall School of Music. The official mouthpiece of the organization is *The Young Musician*, published monthly in London for one penny. The various objects and interests of the National Union of School Orchestras, as well as many other important matters, are discussed by Mr. Paul Stoeving, 'A New Mission for the Violin' (in the Proceedings for 1915 of the Music Teachers' National Association, Hartford, Conn., 1915).

A curious and remarkably successful attempt to increase violin playing in Great Britain was made recently by a firm of musical instrument makers who distributed complete violin outfits for the moderate sum of $5. In a short time no fewer than 400,000 people had received instruments.

The Music Teachers' National Association with headquarters in Hartford, Conn., have a special committee for community music.

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DUNCAN MACDOUGALL.

COMMUTATOR, a piece of apparatus used in connection with many electrical instruments for reversing the current from the battery. There are various forms, which will generally be found described with their proper instruments. See ELECTRICAL TERMS.

COMNENUS, or **COMNENI,** kŏm-nē'nē, an extinct family of Byzantine sovereigns, originally from Paphlagonia, which numbered, on the throne of Constantinople (1057 to 1204) and on that of Trebizond (from 1204 to 1461), 18 emperors, besides 19 kings and numerous independent princes. When the Crusaders had overturned the throne of the Comneni in Constantinople, and established the Latin empire there in 1204, a prince of the ancient house of the Comneni founded an independent state at Trebizond in Asia Minor, where he was governor. The last sovereign of this house was David Comnenus. From him, it is said, was descended Demetrius Comnenus, a French captain of dragoons, who died without children at Paris in 1821, with the title of *Maréchal de camp.* But his descent cannot be historically traced. Ducange asserts without hesitation that Mohammed II, the conqueror of Constantinople, after he had obtained the empire of Trebizond, so called (which was scarcely as large as a French department), from the Emperor David, by a treaty, sent for this prince and his seven children to Constantinople. In order to get possession of the income which had been secured to the Greek prince he ordered him to be put to death, with all his children, at Adrianople in 1462, under pretense of a conspiracy. This is confirmed, according to Ducange, by all contemporary writers—Chalcondylas, Ducas, Phranzes. A remarkable member of the family was the Princess Anna Comnena, daughter of the Emperor Alexius I, who flourished in the first half of the 12th century.

COMO, kō'mō (anciently COMUM), Italy, capital of the province of Como, in Lombardy, 24 miles northwest of Milan in a delightful valley at the foot of Lake Como. It is a bishop's see. The city contains some antiquities, a splendid marble cathedral dating from the 14th century and 12 beautiful churches; also a cabinet of natural history and natural philosophy. During the 11th and 12th centuries Como was at the head of the Ghibelline party, and the rival of Milan. In 1127 it was destroyed by the Milanese and rebuilt by Frederick I in 1159. Later it was ruled by the Rusca family and in 1335 came into the possession of the Visconti. In 1859 it was a centre of the agitation headed by Garibaldi. Here was born Pliny the Younger and Volta and Giovio, writers, also the popes Clement XIII and Innocent XI. A number of the inhabitants travel about with small-wares, such as mirrors, spectacles, little pictures. Even in the time of the Roman emperors this taste for emigration manifested itself. The inhabitants of Como were then to be found in all parts of Italy in the capacity of masons. Silk, velvet, optical glasses, shoes, stockings, metal work and knit wear are manufactured. The province of Como has an area of 1,049 square miles and a population of 515,134. It has fine pastures, and yields grain, olives, wine and silk. Population of the commune 43,439.

COMO, Lake (LAGO DI COMO, lä'gō dē kō'mo, anciently LACUS LARIUS), a lake in the north of Italy, at the foot of the Alps. Toward the middle it is divided into two branches by the point on which is situated Bellagio. The branch extending toward the southwest to the city of Como goes under the same name; that which turns to the southeast to Lecco takes the name of Lake Lecco. The length of the lake to Bellagio is 16 miles, that of the southwest branch 19 miles and that of the southeast branch 12½ miles. The greatest width is two and a half miles. More than 60 rivers and rivulets flow into it, and the Adda passes through it. It is about 700 feet above the level of the sea, and about 190 feet above Milan. Lake Como, the most delightful of all the lakes in Upper Italy, is surrounded by mountains 3,000 or 4,000, or even 7,000, feet high, which descend toward the lake, and in many parts are clothed with woods. It is bordered by delightful gardens and country seats. Fish, particularly trout, are caught in the lake. The neighboring country is rich in minerals — iron, copper and lead.

COMO STAGE, a thin mass of shales and sandstones representing clays and sands deposited in a fresh-water lake that covered southern Wyoming and extended into Colorado. The exact age of the beds is still in dispute; they have been assigned to the top of the Jurassic, though there are good reasons for placing them at the base of the Cretaceous. The beds are remarkably rich in fossils of land reptiles and mammals, including such giant saurians as *Atlantosaurus*, and are typically developed near Como, Wyo. See CRETACEOUS SYSTEM; JURASSIC SERIES.

COMONFORT, Ygnacio, ĭg-nä-sē-o kō-mŏn-fōrt′, Mexican general: b. Pueblo, 12 March 1812; d. 13 Nov. 1863. He became a captain of cavalry in 1832, in 1834 was made prefect and military governor of the district of Tlapa, and in 1842 he was elected member of the National Congress. This Congress was soon dissolved, and Comonfort resumed his functions in Tlapa, displaying great energy in repelling the aggressions of hostile Indians. Appointed 3d alcalde of the capital, and afterward prefect of western Mexico, he relinquished these positions to engage in the war with the United States; and on Santa Anna's dissolving the army and leaving the capital open for the Americans, Comonfort commenced organizing guerrillas, when he was summoned to the Congress of Queretaro, where a treaty of peace was concluded with the United States. He was now chosen senator by his native state, and served in this capacity until 1851. In 1852–53 he was the representative in Congress of the newly created state of Guerrero, and acted as custom-house director of Acapulco and other places until Santa Anna's return to power, when he was dismissed from office. He now joined Gen. Juan Alvarez, raised the standard of rebellion, proclaimed the plan of Ayutla, 11 March 1854, and compelled Santa Anna, who endeavored to seize that town, to retreat. At the end of the campaign in 1855, Santa Anna was finally compelled to abdicate. Alvarez assumed the supreme government, but shortly afterward delegated his authority to Comonfort, who became provisional President of Mexico, 11 Dec. 1855. He soon met, however, with the most strenuous opposition on the part of the clergy, the army and the large body of the Conservative party. The junta of Zacapoaxtla declared itself on 19 December against the President, and a little later the seat of revolution was transferred to the city of Pueblo. Over 5,000 men assembled there in February 1856. Comonfort marched against them, forced the rebels to surrender on 20 March, promulgated on 31 March a decree ordering the confiscation of the property of the Church, followed on 28 June by another decree forbidding the clergy to hold landed estate. At the same time he sent a Mexican envoy to Rome to settle with the Holy See the questions raised by these measures; but the Mexican clergy made all possible effort to prevent his reception, while at home they labored to undermine the government. Congress, which was opened by the President, 5 Feb. 1857, assembled under very inauspicious circumstances. It proceeded, however, to draw up a new constitution, which vested the legislative power and the control over religious and military affairs exclusively in Congress. The President, finding it impossible to meet the difficulties which agitated the country under such restrictions, was eventually constrained, on October 1857, to apply for extraordinary powers. These were granted by Congress on 4 November and he was proclaimed constitutional President on 1 December. His position, however, became more and more critical. Opposed by the clergy and the army, he found himself isolated, and could only depend upon the brigade of General Zuloaga, which was attached to him personally. By a pronunciamento at Tacubaya, 17 December, this brigade, too, declared itself against the new constitution, but appointed Comonfort chief of a new government. By a new pronunciamento, however, of 11 Jan. 1858, they discarded him altogether, and the insurrection which broke out on that day in the capital led to a fierce struggle of several days. Appointing Juarez, president of the Supreme Court, provisional President, Comonfort attempted to regain his authority by force of arms, but in vain. On the morning of 21 January the capital was in the hands of the rebels. The House of Representatives, convoked on the same day by Zuloaga, appointed that general provisional President, while Juarez convened a Congress at Guanajuato, to guard the rights of Comonfort. The latter in the meantime, deserted by his soldiers, and unable any longer to maintain his power, repaired to the United States. He returned in 1861 and was Minister of War in the Juarez cabinet. He was also appointed general of one of the armies of the Republican party, and for a time he held command of Zaragoza. He was sent to the relief of Puebla in 1863; but he was defeated by an Imperialistic force to which the city was afterward forced to surrender. Subsequently Comonfort was killed by a party of guerillas who shot him from ambush.

COMORIN. See CAPE COMORIN.

COMORO ISLANDS, a volcanic group in the Indian Ocean, between the northern extremity of Madagascar and the continent of Africa. They are four in number — Angareja (called also *Comoro*), Mohilla, Johanna and Mayotta. In 1843 France took possession of the last mentioned island, and the others were taken under the protection of the same country, by treaty, in 1886. They are extremely fertile, well stocked with cattle, sheep, hogs and birds of various kinds. They produce, likewise, sweet and sour oranges, citrons, bananas, honey, sugar-cane, rice, ginger, coconuts, etc. The people are chiefly engaged in rearing cattle, and in the manufacture of coarse cloths, jewelry and small arms. They are professed Mohammedans, but fetish worship is customary. Pop. Arabs and negroes, 70,000.

COMPANY (Old Fr. *companie*, from Lat. *companirem*, «mess,» from *com-*, «with,» and *panis*, «bread»), an association of individuals formed for some purpose of mutual advantage, especially for business purposes. The commercial use of the word which bulks most largely now has two separate uses: in general of a firm or corporation; and particularly of the silent members of a business house whose names do not appear in its style but are comprehended by the affix «and Company.» Historically the earliest occurrence of the term in connection with business enterprise dates in England back to the 14th century when the Merchant Adventurers of England about 1359 began trade. English commerce and empire are equally indebted to the efforts of the companies formed in the early part of the 17th century. The Eastland Company, the Muscovy Company and the Turkey Company carried English trade into eastern Europe. The East India Company won the major part of the Asiatic trade for England, and gained possession of India and administered that country until the middle of the 19th century. The Virginia Company and the Massachusetts Bay Company prepared the way for English colonization in America, but never flourished. The history of the Hudson Bay Company is another interesting episode because of the combination of territorial and trading grants which it long held and because it still enjoys trading privileges. England still employs the same method of opening up trade, and the North Borneo Company, the British East Africa Company and the famous South Africa Company were formed between 1880 and 1890. Germany with her new imperial policy fosters the formation of such associations, and in 1884 the German East Africa Company was started, with the object of extending trade and colonization. The London City companies also are historically important as outgrowths of the mediæval guilds and because for many years membership in them was a necessary preliminary to political privilege of any sort; their authority was curtailed in 1725 and by the reform bills of the 19th century, but members of the companies are still the only electors for civic offices.

In modern commerce companies may be most conveniently divided into the simple firm or partnership, which is a mere mutual agreement, and the stock company, which, by reason of its complex character and quasi-public nature, comes under State control and has displaced to a great degree the simpler method. In the stock company, instead of a private agreement, the members, under State authorization, make a company with a fixed capitalization divided into a certain number of shares, possession of which carries the right to vote, proportionally to holdings, on matters of business policy. State regulations require in all cases that one of the contracting parties be a resident of the State in which the company is incorporated, and that an office of the concern be located in the State. Other requirements vary in different States, especially in the matter of fees, which some of the western States have reduced to a minimum for the sake of attracting business to the State, and replenishing its treasury; and in the breadth and range of powers granted by the charter. The corporation laws of the State of New Jersey, together with its convenient situation near New York, have drawn a tremendous volume of this business to it. See CORPORATION; TRUSTS.

A particularly American class of stock company is the industrial, which is especially adapted to mine-exploiting or the development of agricultural business. In mode of government it differs from the usual shareholder controlled company, as it is largely managed by a promoter. (See JOINT-STOCK BANKS; PARTNERSHIP). Consult Anderson, 'Origin of English Commerce'; Cawston and Keane, 'Early Chartered Companies'; Cunningham, 'Growth of English Industry and Commerce'; Davis, 'Corporations: Their Origin and Development' (New York 1905); Bonassieux, 'Les grandes compagnies de commerce' (Paris 1892); Ditchfield, 'The City Companies of London and their Good Work' (London 1904); Unwin, 'Industrial Organizations in the Sixteenth and Seventeenth Centuries' (Oxford 1904); id., 'The Guilds and Companies of London' (London 1908).

COMPANY, in military nomenclature regularly designates an integral part of a regiment or battalion and consists of 100 men. A looser and typically American use of the word applies it to any small body of soldiers or uniformed men, especially as independent of a State or national soldiery. These independent companies form a valuable supplement to army and State militia, as was evidenced by their service in the Spanish War. See ARMY ORGANIZATION; TACTICS.

COMPARATIVE LITERATURE. See LITERATURE, COMPARATIVE.

COMPARATIVE PHILOLOGY. See LANGUAGE, SCIENCE OF.

COMPARATIVE PSYCHOLOGY. Animal psychology, comparative psychology and genetic psychology should be defined together and by contrast, first, because they are intimately related, and second, because there is serious disagreement between popular or current usage and strictly technical usage. Briefly, animal psychology designates certain materials of observation; comparative psychology, a particular scientific method of procedure; and genetic psychology a particular aim, goal or purpose, namely, genetic or historical description of mind. These statements may be somewhat expanded as follows.

Animal psychology actually means, in common usage, the study of mind in animals exclusive of man. Logically, it should mean the study of mind in animals (including man) as contrasted with plants, for there appears adequate ground for assuming that mind exists in plants.

Comparative psychology has long been used as practically synonymous with animal psychology, that is, as the study of infrahuman animals. Logically, and by analogy with other sciences, it should mean the application of the method of comparison to the phenomena of mind wherever and however presented for observation. Its meaning in terms of purpose and method should be the same as that of comparative anatomy, comparative physiology, comparative philology or comparative literature, namely, the more nearly complete and more profitable knowledge and understanding of a group of facts by comparison thereof with more or less closely related facts. The problems of origins and of developmental relations must ever be prominent in a comparative science. Secondly, the comparative method contributes directly and importantly to genetic description.

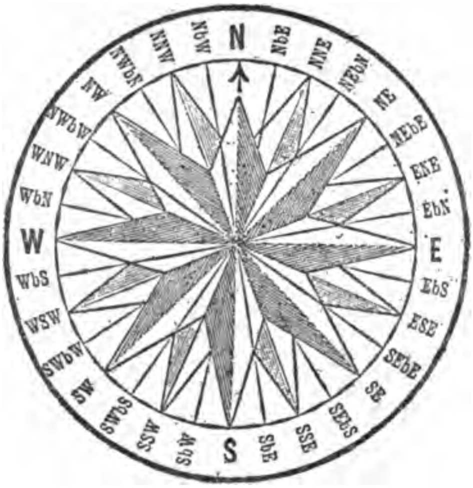
Genetic psychology is the study of the evolution of mind (phylogenesis of mind) in plants and animals and of the development or growth of mind (ontogenesis of mind) in individuals. This branch of psychology is definable solely in terms of its primary purpose or aim, which is genetic description. Indeed, genetic psychology is simply the historical aspect of the study of mental life. Animal psychology, as also plant psychology, child psychology, abnormal psychology and social psychology, should contribute facts to genetic psychology, and comparative psychology should supply special methodological assistance. But genetic psychology as a special aspect of the general science should be restricted to no particular group of mental facts, to no single method. Instead, it should command all materials and all methods in the interests of a description of the processes of mental development and mental evolution. See Animal Psychology; Genetic Psychology; Psychology.

Robert M. Yerkes,
Professor of Psychology, University of Minnesota.

COMPARETTI, kom′pä-ret′tē, **Domenico Pietro Antonio,** Italian philologist: b. Rome 1835. At first he gave his attention to mathematics and natural science. Afterward he studied Greek by himself and in 1859 was appointed professor of Greek at the University of Pisa. He soon after removed to Florence and thence to Rome where he lectured on Greek antiquities at the university and studied the excavations in the Forum. He is also eminent in Romance philology and in the social history of the Middle Ages. After 1884 he edited the *Museo italiano di antichità classica.* His more important works are 'Saggi dei dialetti greci dell' Italia meridionale' (1866); 'Virgilio nel medio evo' (1872; Eng. trans., 1899); 'Papiro ercolanese' (1875); 'La commissione omerica di Pisistrato e il ciclo epico' (1881); 'Iscrizione arcaica del foro Romano' (1900). With D'Ancona he edited 'Conti e racconti del popolo italiano' (9 vols., 1870–91); and was also one of the editors of *Rivista di filologia e d'istruzione classica.*

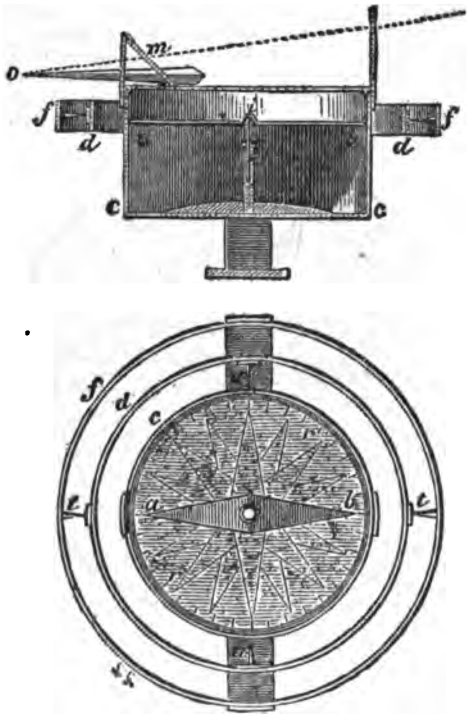
COMPARISON, in grammar, the variation of an adjective or adverb used to express a higher and the highest degree, or a lower and the lowest degree of what is denoted by the word, thus modified in its grammatical form. The positive can scarcely be considered as a degree, as it denotes the quality generally without comparison. The comparative compares two things only, the superlative compares one thing with any number of others. In English the comparative is generally formed by the addition of *er,* the superlative by the addition of *est,* to the positive or monosyllabic adjectives and dissyllabic adjectives ending in *y,* or by the use of the words *more* and *most, less* and *least,* when the adjective is of more than one syllable and does not end in *y.* Adverbs are nearly always compared by the latter method. There are some adjectives, such as *good, better, best; little, less, least,* that do not form their degrees of comparison in the regular manner.

COMPASS, Mariner's, an instrument to ascertain directions at sea by means of the attraction of the earth for a movable magnet or a set of magnets. Similar instruments consisting of a magnetized needle resting on a pivot are used by the soldier or woodsman to determine directions on land. In the mariner's compass a thin circular sheet of mica is supported so as to turn with great freedom in a horizontal plane about its centre. This is called the compass-card. The bearing usually consists of a small plate of agate let into the card, and has a conical hole at the centre, and this rests on a fine needle-point of hard steel. This arrangement gives very little friction. To the under surface of the compass-card several parallel magnets are attached. Many experiments have been made to find the best arrangement for the magnets, but there is probably still something to be learned on this question, though the scheme patented by Lord Kelvin, in which the needles are suspended from the card in such a way that the moment of inertia of the card about every diameter shall be the same, is the most generally used. The compass-card is marked with a star of 32 rays, which are called the rhumbs, or the points of the compass. A line joining two of these points diametrically opposite is or ought to be exactly parallel with the magnetic axis of the arrangement below; and at the extremities of these points are marked N. (north) and S. (south). E. (east) and W. (west) are marked at the extremities of another diametral line at right angles to the first. The other points have also names; and to repeat these from memory in order, beginning at north and going round the whole circle, is what sailors call "boxing the compass." Most compasses are also graduated in degrees, either separately in each quadrant from north and south, or from 0° to 360° from north in a clockwise direction.



Compass Card

The card is supported, as we have said, on a steel point, which is attached either to a hemispherical bowl of thick copper, or to a thick copper ring when the compass is to be used for night-sailing in which case a lamp placed below the ring shines up through the mica card and makes the markings on it visible. This thick copper bowl or ring is called the compass-box. Its use is to damp the vibrations of the needle; for it is found that the presence of a large mass of copper properly placed damps the vibrations of a freely suspended magnet rapidly, while it does not at all prevent it from coming to rest in the proper position. In certain forms of compass, part of the weight of the card is borne by a non-freezing liquid, which also serves to damp its oscillations. The compass-box is suspended on gimbals, which are two concentric copper rings. The larger turns on a horizontal axis, whose extremities rest on the inside of the case that contains the compass. The smaller ring turns on a horizontal axis at right angles to the former, and resting on the outer ring. The compass-box is attached to the inner ring, and its weight tends to keep both horizontal. Thus supported, the compass-box and card always remains horizontal however the ship rolls or pitches. The chief difficulty in making use of the compass arises from the magnetism of the ship itself. In iron ships particularly, the magnetism of the ship greatly interferes with its indications. The effect of the ship's magnetism is determined by swinging the ship, and determining a correction to be applied for every position. This, however, is liable to some uncertainty, for it is found that rough weather and other circumstances alter the magnetism of the ship, and therefore its effect on the compass. It is usual to place a compass at the mast-head of large ships, and from time to time to compare the deck compass with it. Furthermore, the inherent magnetism of the ship is compensated for to a great degree by an extremely complicated arrangement of bars of soft iron and magnets placed in the binnacle.



Ship's Compass

a b, Needle. *c c*, Box. *d d*, Inner gimbal. *f f*, Outer gimbal. *i*, Pivot upon which the card is placed. *m*, Reflector. *r r*, Card. *t t*, *u u*, Supporting pivots.

The origin of this instrument cannot be traced with anything like certainty. It has been supposed that the Chinese knew something about the polaric property of loadstone more than 2,000 years before the Christian era. In the 12th century the compass became known in Europe. Whether it was learned from the Orient is not certain. The Italians ascribe the invention of the compass to Flavio Gioja, a native of Amalfi, giving the dates 1300–20, but it has been shown that he can be credited only with some important improvement of the instrument. The discovery of the variation of the needle has been generally attributed to Columbus, but is now supposed to have been known much earlier. See GYROSCOPIC COMPASS; MAGNETISM.

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COMPASS PLANT (*Silphium laciniatum*), a tall composite yellow-flowered plant growing on the prairies of the Mississippi Valley, and remarkable from the fact that its erect radical leaves stand so that their edges point almost exactly north and south, especially in midsummer. This is said to be due to the action of light, and to depend on the leaves having an equal number of stomata on either face. The plant is known in some localities as "resinweed," because it contains such a large amount of resinous matter. A European species of lettuce (*Lactuca scariola*) has received the same name.

COMPASSES, mathematical instruments used for describing circles, measuring lines, etc. They consist simply of two pointed legs movable on a point or pivot. For describing circles the lower end of one of the legs is removed and its place supplied by a holder for a pencil or pen. Hair compasses have a spring tending to keep the legs apart, and a finely threaded screw by which the spring can be compressed or relaxed with the utmost nicety, and the distance of the legs regulated to a hair's-breadth. Bow compasses have the legs united by a bow passing through one of them, the distance between them being adjusted by means of a screw and nut. Proportional compasses, used for reducing or enlarging drawings, have the legs crossing so as to present a pair on each side of a common pivot. By means of a slit in the legs, and the movable pivot the relative distances between the points at the respective ends may be adjusted at pleasure in the required proportion. Beam compasses are used where greater lengths are needed than can be secured by the ordinary pivot compasses. Points are arranged on a sliding bar so they can be clamped at certain distances from each other. Triangular compasses, having three legs, are used when it is desired to transfer the vertices of a triangle. Club compasses, or bullet compasses, are constructed with a ball instead of one of the points of the ordinary compasses; the ball being arranged so as to turn in a hole or socket.

COMPENSATION, that which is given or received as an equivalent for services rendered, losses sustained, sufferings endured or in payment of a debt; amends, remuneration, payment, recompense. When one is sued for a debt, it is competent for him, partially or wholly, to bar the claim by alleging that he is the plaintiff's creditor for services rendered or money lent. If the sum claimed from the plaintiff is found to be the exact equivalent of that for which he sues, the two are held to compensate or balance each other; if, on the contrary, it be less, it diminishes by so much the prosecutor's claim. If, however, the defendant feels that he owes the plaintiff more than that individual is indebted to him, he is required at the outset to pay into court the smaller sum for which he admits himself to be responsible.

Compensatio injuriarum is a defense against actions for damages claimed for slander, false accusations and like causes.

COMPENSATION, Workmen's. See ACCIDENTS, CAUSES AND PREVENTIONS OF; WORKMEN'S COMPENSATION.

COMPENSATION BALANCE, or PENDULUM, a balance-wheel or pendulum for a watch or chronometer, so constructed as to make isochronal (equal time) beats, notwithstanding changes of temperature. This effect is usually attained by having the balance-wheel cut into two segments, the arcs being fixed at one end each. This allows space for the expansion and contraction to counteract the varying strength of the spring. A compensation pendulum is generally what is known as a mercurial pendulum or a gridiron pendulum. It is constructed of two different metals, such as brass and iron, which so work against each other, that the expansion of the one downward is counteracted by that of the other upward. By this arrangement the pendulum does not vary in length, and consequently, in frequency of vibration, whatever the temperature may be. Arnold's compensation balance-wheel for chronometers and watches is constructed on a similar principle. See CHRONOMETER.

COMPENSATION INSURANCE. See WORKMEN'S COMPENSATION.

COMPENSATION PENDULUM. See COMPENSATION BALANCE.

COMPETITION, a term nearly equivalent to the phrase «struggle for existence.» Lamarck was the first to point out definitely the fact of competition in the cases of man and the sloth, but it was not until a half-century later that Darwin and Wallace emphasized its far-reaching importance as a biological agent in evolution. Competition may be most strikingly illustrated by a case in which it is entirely absent. The Great Salt Lake of Utah is inhabited by the brine shrimp (*Artemia fertilis*), which abounds in enormous numbers in the dense briny waters; hundreds may be dipped up in a dish of water and thousands captured by a few sweeps of the tow-net. As the water is so salt that no other animal can live in it except a maggot near shore, it has absolutely not an enemy, and there is no other form to compete with it. Its food is a floating green alga (*Polycystis packardii*). It is absolutely harmless and without means of defense, and lays but few eggs; yet its success in point of numbers is beyond all precedent. Another case is that of a fly (*Ephydra gracilis*) whose larva abounds at the margin of the same lake. These two cases illustrate how a species may abound in profusion, though not crowding out other forms, since there are no competitions.

A familiar example of the crowding out of native species by those introduced from foreign countries in the struggle for existence among plants is the ox-eye daisy, which was introduced from Europe, first appearing in Leicester, Mass., in 1740. Many years ago what were once throughout New England green fields of grass became white with its flowers; it drove out even the grasses introduced. On the other hand, in central Europe, throughout France, the Pyrenees and the Alps, as recently observed, it grows sparsely, never in extensive patches. Other examples are the introduced European injurious insects, the gipsy moth, the scale insects and many others, whose numbers in the Old World are kept within due limits by ichneumon parasites, but which in the United States and Canada, owing to the absence of their natural enemies, breed in unlimited numbers. Another case is that of the Colorado potato-beetle, which spread eastward from comparatively limited tracts in the Rocky Mountain region, and invaded the Eastern States to the shores of the Atlantic. The English sparrow, introduced during a period from 1850 to 1870, has become, owing to the lack of competition, a grievous pest, driving out the native birds. The periwinkle (*Littorina littorea*) of the European coast, introduced on our shores, about 1855, has multiplied to such an extent that it lives between tide-marks in millions, to one of our native species of the same genus. Such cases as these throw light upon the subject and prove that there is a silent but unceasing struggle for existence going on over nearly all the earth's surface. Yet in the case of desert plants which grow sparsely, separated by barren spaces, there is, as Henslow has observed, no struggle for existence.

Nowhere is the agency of competition more marked than in human society. In the lower savage races, as in the black race of Africa or the natives of Australia, the scattered tribes have confined their contests to simple raids, and no single people or sub-race has gained marked pre-eminence over another, with the exception of the Hottentots and Bushmen, who were largely exterminated by negro tribes from the North. But as we ascend to the higher or white race, to the Semitic, the western Asiatic and European peoples, we have examples of the sudden rise to power and pre-eminence of vast hordes of barbarian peoples under Tamerlane, the Grand Mogul, Attila and other conquerors, which have swept over vast territories and crushed the weaker, more peaceful or even civilized but less resistant nations. The rapidity with which the Arabs overran and still dominate northern Africa in language, social customs and religions; the Mongolian movements eastward into China, and westward to the borders of Europe; the successive rise and irresistible waves of migratory hordes from eastern to northern Europe, throughout prehistoric and historic times; the colonizing and expansion of the powers of Greece, of Rome, of the Norsemen, Anglo-Saxon, the Spanish, French and German peoples; the success of the white race in the struggle for pre-eminence; the disappearance of the lower, weaker races, less favored intellectually and morally, some of which had become fossilized, or semi-fossilized, and practically inept and unfit,—all these phenomena, which are historic facts, are of a piece with what we witness, though in a less distinct and marked way, in the plant and brute realms. The results are in the long run beneficent, though the injustice, moral degeneration, suffering and evils which attend human progress are pitiful and deplorable.

In the economic as in other fields, competition is the natural law, and is taken to represent, through the free play of individual self-interest, the «survival of the fittest.» Here the surest means of success is the underselling of competitors. In its natural or unrestricted form, each nation or corporation or individual produces the goods most adapted to its economic conditions or its talents, securing trade in competition with like products. Under the old mercantilist theory, colonies existed solely for the benefit of the mother country, and their trade was kept strictly as a preserve for the dominant nation, it being manifested that what one nation gains in trade the other necessarily loses. This narrow theory was exploded by political economists beginning with Adam Smith, the view since taken being that every country is benefited by the prosperity of its neighbors. Economic competition naturally finds its most expansive field of operations in an open market, from which all barriers, tariff or otherwise, have been removed. Due to its adoption of a free-trade policy, the British Islands may be considered as almost the only country in which there is unrestricted world wide competition. The «survival of the fittest» implies the driving of the weakest to the wall; and in its operation in the last century it was seen that this involved the ruin not only of weak and inefficient competitors, but was a fruitful means of underselling by concerns with large capital at command for the purpose of driving competition from the field and ultimately establishing monopoly prices. It has also led to cut-throat competition when goods are sold or dumped down for sale at less than cost of production; or among laborers, when competition for jobs has led to the lowest price for labor becoming the standard, or to displacement by the application of machinery throwing workmen out of employment and occasioning distress. The rise of the trade union movement, having for its object the stimulation of wages, and the protection of the laborer, and of employers' associations to combat these, and the passing of factory and workship legislation, all tend to modify competition. Thus competition has tended to bring into operation its opposite, combination, and this again has led to monopoly and price control. The era of business consolidation which began in the United States more than 20 years ago, with its resultant control by the mergers of raw material and finished product alike, and the operation of the big trusts, have in many industries made competition a dead letter. In the great natural monopolies of lighting, water and transportation services, in which the public interest is so paramount that it cannot be subordinated to private gain, the opinion has steadily grown that these utilities must be operated on behalf of the public. The difficulty that faces schemes for the elimination of competition is that in its replacement the constant spur to human energy and resourcefulness which the system affords may be lost.

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COMPIÈGNE, kôṅ-pyă'nyę, town of northern France, in the department of Oise, and on the left bank of the river Oise, 45 miles north-northeast of Paris. It has a tribunal of commerce, a communal college, a public library, a theatre, manufactures of muslin, hosiery and cordage, besides a trade in wood, grain and cattle. The Hôtel de Ville is a Gothic structure of the 16th century. The splendid château, surrounded by its extensive and beautiful park, bordering on the celebrated forest of Compiègne, was a favorite autumnal residence of Napoleon III. Charles VI took this town from the Duke of Burgundy in 1415. In 1430 Joan of Arc was taken prisoner here by the English. Compiègne was the headquarters of the German army in 1870–71. In 1914 the town fell to the Germans in their drive toward Paris. In the battles of the Marne and Aisne the town suffered severely from shell fire, was retaken by the French, but during the German advance in June 1918, was again threatened by the Germans who pushed on toward it on the Noyon-Mondidier front. Compiègne is the birthplace of George Guynemer, the foremost airman of France, who before his tragic death in 1917 had won every honor that his grateful country could bestow. Pop. 17,046.

COMPLAINT, *in law*, the name given in some States to the written statement on which the plaintiff's case is founded; corresponding to the *declaration* at common law, the *bill* in equity and the *libel* in admiralty. In *criminal law*, an allegation made to a proper officer that a designated offense has been committed, accompanied by an offer to prove, and a request that the offender be punished.

COMPLEAT ANGLER, The. Though Izaak Walton's ‘Compleat Angler’ is actually, as its title implies, a treatise on angling, it is not by reason of any technical excellence that it has become an English classic. The prosaic angler of Walton's own day (consult Robert Franck's ‘Northern Memoirs,’ 1694; re-edited by Sir Walter Scott, 1821) was ill-satisfied with him as a practical fisherman; but the whole of angling is not in the catching of fish — else there were little distinction between an angler and a fishmonger. It is the animating spirit of any sport which is the most important thing about it, and Walton's success largely lies in his having so persuasively caught and preserved the spirit of angling, the peculiar aptitudes which fit a man to follow what Walton happily described, in his sub-title, as «the Contemplative Man's Recreation,» the natural gift to «be quiet, and go a-angling.» The born fisherman is necessarily a lover of quiet and a lover of nature in her peaceful natural aspects, and he is likely to be something of a philosopher and to have a bookish tinge to his thoughts, as he sits hour after hour by the stream-side. Otherwise he can scarcely he called a «compleat» angler. Such a man, with a pervading tincture of quaint old-world piety, was Walton himself, and it is because he chanced to be so typical an example of the angling fraternity and was able, in speaking for himself, to speak so authentically for all anglers of all time, that 'The Compleat Angler' has become the sacred book of those, who, as Walton was fond of reminding his readers, follow Saint Peter's calling; and that Walton is not only «Honest Izaak» but also «Saint Izaak,» the patron saint of the brethren of rod and reel. Walton in his writing, as Lowell has pointed out, has «an innocent air of not knowing how it is done.» It is all so artless, we say, this quite fragrant writing, but the art is there, all the same. Artlessness in literature, while it begins in a natural grace, *dei gratia*, is never achieved without the expenditure of that art which conceals itself; and Walton's «Lives» prove him the possessor of a literary gift which was not dependent on a limited subject matter for its exercise. That is, he was not merely a born angler, but also a born writer; in his degree, an artist in words. Otherwise, he would only have anglers for readers; whereas 'The Compleat Angler' is for all who love good literature. No doubt, it was Walton's artless art which led him to choose the form he has given to his book, that of a prose pastoral, with «Piscator» and «Venator» (who have «well overtaken» each other on «Tottenham Hill,» «this fine fresh May morning»), for the chief interlocutors; with an occasional falconer,— «Auceps»— and milkmaid, thrown in. This form, recalling Theocritus and Virgil, gives a gentle dramatic setting and interplay of character, as also an «open road,» gipsy quality, to the «discourse.» It has the charm of the walking-tour of two friends along a river-side, who, while they fish the stream, talk of the antiquity of anything, or «How to fish for and to dress the chub,» or of the curiosities of natural history as found in Aldrovandus and Gessner, and other naturalists of the time; and, «whilst this shower falls so gently upon the teeming earth,» sit together under the honeysuckle hedge, and recite to one another «old-fashioned poetry but choicely good, I think much better than the strong lines that are now in fashion in this critical age» — Dubartas, Sir Walter Raleigh and «holy Mr. George Herbert.» Then, with the twilight, an old time English inn for supper, with a hostess, and her daughter to sing them an old-world ballad at bedtime. For «Merry England» still lives in this book — that is another of its claims for remembrance — Herrick's England of the Morris-dance and the maypole, and a peasantry that still cared for music and flowers. And the old English countryside, with its homes of ancient peace, its primroses and cowslips and hawthorn, as well as its various rustic characters, lives in this book as perhaps nowhere else in literature out of Shakespeare's plays. For this reason, it may with justice be described as the one English pastoral. This special quality of green «quiet» is the more surprising as 'The Compleat Angler' was written in that time of storm and stress succeeding the execution of Charles I. It was first published in 1653, and from that date on — such a remarkable appeal has this quiet book had for mankind — a new edition has, on the average, been published every two and a half years. Walton was a meticulous reviser of his work, and in 1676 (being then 83; he died at 90) he gave forth his final «definitive» edition, the 5th. To this edition he invited his friend Charles Cotton to add a second part, which has thus become an integral, not unnecessary, portion of 'The Compleat Angler.' It has the value, moreover, of commemorating a charming friendship, a friendship the more surprising as Cotton was a brilliant young man-about-town, and Walton a patriarchal associate of bishops and deans. But both men had the gift of humanity, and it is by that sovereign gift, inclusive of all others, that 'The Compleat Angler' still remains a classic in a day which has too much forgot its final admonition — «Study to be quiet» (1 Thess., iv, 11). 'The Compleat Angler' has been a favorite book with many famous writers. Dr. Johnson considered «the preservation and elucidation of Walton»—«a pious work,» and such different men as Scott, Wordsworth and Lamb have been among his many «disciples.»

Richard Le Gallienne.

COMPLEMENT, that which fills up to a certain unit. Thus the complement of an angle is the angle which would, by addition, make the given angle a right angle; and the complement of a number is a number which would, by addition, make the given number equal to the next higher unit, or the next higher power of 10.

In music complement is the interval formed by the higher note and the note an octave above the lower note of a given simple interval.

In medicine the complement or the complementary body is supposed to be a substance in the blood serum that is necessary for its antibacterial or bacteriolytic action. In order to bring about a lysogenic action (*Pfeiffer phenomenon*), two bodies seem to be necessary in the blood serum. One known as the immune serum is developed during the process of immunization. It alone cannot however cause bacteriolysis. There must be present in the blood serum another body, the complement. It is also called alexine or cytase. See Immunity.

Complement also has the signification of that which is added as ornamental but not as necessary, as an accessory or appendage or as an accomplishment. It has exactly the same origin as *compliment,* which is used to express a formal act or expression of civility, respect or regard.

COMPLEX NUMBERS. See Algebra.

COMPLEX VARIABLE, Theory of Functions of a. 1. Function.— The Theory of Functions of a Complex Variable deals with ordinary complex numbers, $z = x + yi$, when x and y are real, and i denotes the pure imaginary number $\sqrt{-1}$. Just as real numbers are represented by points on a line, e.g., the points of the axis of x in analytic geometry, so complex numbers are represented by points in a plane, called the *complex plane,* z corresponding to that point whose Cartesian co-ordinates are (x, y). The distance $\sqrt{x^2+y^2}$ of z from the point $z=0$ is called the *absolute value* of z and is written $|z|$. Let S denote a region of the plane bounded by one or more closed curves. To every point z of S let one or more numbers w, real or complex, be assigned according to some definite law. Then w is said to be a single- or multiple-valued *function* of z: $w=f(z)$. For the present we shall restrict ourselves to single-valued functions.

2. **Continuity and Limits.**— The function $w=f(z)$ is *continuous* in the region S if, when z describes any continuous curve in S, the image w of z describes a continuous curve in the w-plane. The variable $f(z)$ is said to *approach b as its limit,* if, when z approaches a along an arbitrary path, the corresponding point $w=f(z)$ approaches the point $w=b$; in symbols,

$$\lim_{z=a} f(z)=b.$$

A complex variable z is said to *become infinite:* $\lim z=\infty$, if its absolute value becomes infinite; i.e., if the corresponding point of the complex plane recedes indefinitely, no matter in what direction.

3. **Derivative.**— The function $w=f(z)$ has a *derivative,* $f'(z)$, if the quotient $\Delta w/\Delta z$ approaches a limit, when Δz approaches 0:

$$\lim_{\Delta z=0}\frac{f(z+\Delta z)-f(z)}{\Delta z}=f'(z)=D_z w.$$

When z is the independent variable,

$$dw=D_z w \Delta z;$$

and it is shown, as in the differential calculus, that

$$dz=\Delta z \text{ and } dw=D_z w\, dz,$$

the latter relation holding no matter what the independent variable may be. The general rules for differentiation apply here, e.g.,

$$d(U+V)=dU+dV, \text{ etc.}$$

Moreover, we have

$$\frac{d(z^n)}{dz}=nz^{n-1},\quad n=\text{pos. integer.}$$

Hence it follows that all rational integral functions, i.e., polynomials in z, and all other rational functions of z, can be differentiated according to the same rules as reals.

Theorem: The necessary and sufficient condition that the function

$$w=u+vi=f(x+yi)$$

have a continuous derivative is that the real functions u and v of the real variables x and y have continuous first partial derivatives satisfying the *Cauchy-Riemann Differential Equations:*

$$\frac{\partial u}{\partial x}=\frac{\partial v}{\partial y},\quad \frac{\partial u}{\partial y}=-\frac{\partial v}{\partial x}. \qquad (1)$$

The condition is necessary. For since we shall always get one and the same limit, no matter along what path Δz may approach 0, let Δz pass first only through real values: $\Delta z=\Delta x$; thus

$$\lim_{\Delta x=0}\frac{\Delta w}{\Delta x}=\frac{\partial w}{\partial x}=D_z w.$$

Secondly, let Δz be pure imaginary: $\Delta z=i\Delta y$; then

$$\lim_{\Delta y=0}\frac{\Delta w}{i\Delta y}=\frac{1}{i}\frac{\partial w}{\partial y}=D_z w.$$

Hence

$$\frac{\partial w}{\partial x}=\frac{1}{i}\frac{\partial w}{\partial y},$$

and it remains only to separate the real and the pure imaginary terms. We omit the proof of the sufficiency of the condition.

Two functions which satisfy relations (1) are called *conjugate functions.*

Example: Let

$$w=e^x(\cos y+i\sin y).$$

Then
$$\frac{\partial u}{\partial x}=e^x\cos y=\frac{\partial v}{\partial y},$$
$$\frac{\partial u}{\partial y}=-e^x\sin y=-\frac{\partial v}{\partial x}.$$

Hence w has a derivative, and furthermore

$$\frac{dw}{dz}=w.$$

A function which is single-valued throughout a region S and has a continuous derivative in S is said to be *analytic in S.* The terms *holomorphic, monogenic* and *synectic* are also sometimes used in this sense.

4. **Conformal Mapping.**— Given any two functions

$$u=\phi(x,y),\quad v=\psi(x,y), \qquad (2)$$

we may interpret them geometrically as transforming the points of one plane into the points (u, v) of a second plane. Thus a region S of the first plane will be *mapped,* if certain further conditions are fulfilled, in a one-to-one manner and continuously on a region Σ of the (u, v)-plane. For example, let

$$u=x^2-y^2,\quad v=2xy.$$

Here the first quadrant of the (x, y)-plane is mapped on the upper half of the (u, v)-plane, the family of lines u=const. going over into the family of equilateral hyperbolas whose axes lie in the co-ordinate axes, and the family of lines v=const. going over into the orthogonal family, whose asymptotes are these axes.

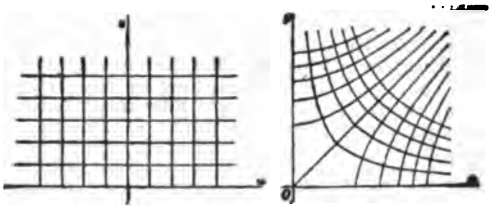


Fig 1.

If u and v have continuous first partial derivatives and if their Jacobian

$$J=\begin{vmatrix}\frac{\partial u}{\partial x} & \frac{\partial u}{\partial y}\\ \frac{\partial v}{\partial x} & \frac{\partial v}{\partial y}\end{vmatrix}$$

does not vanish then, at least for a restricted region S_0 about a point (x_0, y_0), the equations (2) will always define a one-to-one map of S_0 on a region Σ_0 including the point (u_0, v_0). This map will represent approximately (i.e., to infinitesimals of higher order than the first) a projection — in other words strain — of the immediate neighborhood of (x_0, y_0) on that of (u_0, v_0), a small circle about (x_0y_0) going approximately into an ellipse about (u_0, v_0). If, however, u and v are conjugate functions, the ellipse becomes a circle, and the angle under which two curves intersect in the (x, y)-plane is preserved in the (u, v)-plane. Thus the shapes of small figures are but slightly distorted. Such a map is called *conformal* or *isogonal*. The elements of corresponding infinitesimal arcs in the two planes are connected by the relation

$$dS = M ds,$$

where M is a positive function of x and y, and does not depend on ds, dS. The Jacobian here has the value

$$J = \left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial v}{\partial x}\right)^2.$$

Referring to the developments of § 3 we see that the theorem just stated is coextensive with the following:

Theorem: If $w = f(z)$ is single-valued and analytic in the region S, then this function maps the neighborhood of any point z_0 of S, in which $f'(z_0) \neq 0$, in a one-to-one manner and conformally on the neighborhood of the point $w_0 = f(z_0)$.

The problem of conformal mapping first studied was that of making a map of the earth such that the shapes of small regions should be but slightly distorted. The two principal solutions that presented themselves were (*a*) *Ptolemy's Projection*, known in mathematics as *stereographic projection*, which consists in passing a variable ray through a fixed point of the sphere, which we will think of as the north pole. Let P and Q be respectively the variable intersections of this ray with the sphere and with the plane of the equator, or a parallel plane, taken as the plane of the projection. Then Q is the projection of P. (*b*) *Mercator's Chart.*

By a *simply connected region* is meant a region bounded by a single curve. Any simply connected region can be mapped in a one-to-one manner and conformally on the interior of a circle, and hence any two such regions can be mapped conformally on each other (Riemann, 1851).

5. The Elementary Functions.— (*a*) The Exponential Function. For real values of x the function e^x can be expanded by Taylor's Theorem into the series

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

Substituting formally for x a pure imaginary value and operating with the infinite series as if it were a polynomial, we get

$$1 - \frac{y^2}{2!} + \frac{y^4}{4!} - \frac{y^6}{6!} \dots + i\left(y - \frac{y^3}{3!} + \frac{y^5}{5!} - \frac{y^7}{7!} \dots\right)$$
$$= \cos y + i \sin y.$$

This formal work suggests a *definition* of e^z for a pure imaginary value of the argument, namely:

$$e^{yi} = \cos y + i \sin y, \qquad (3)$$

and it is this definition that we shall adopt, setting it at the same time more generally

$$e^z = e^{x+yi} = e^x (\cos y + i \sin y).$$

The function of e^z thus obtained is a true generalization of e^x, for it is single-valued and analytic for all values of z, reduces to e^x when z is real, and satisfies the same functional relations as e^x:

$$e^{z_1} e^{z_2} = e^{z_1 + z_2}, \quad \frac{de^z}{dz} = e^z.$$

(*b*) The Trigonometric Functions. When x is real, we have from (3)

$$\sin x = \frac{e^{xi} - e^{-xi}}{2i}, \quad \cos x = \frac{e^{xi} + e^{-xi}}{2}.$$

The right-hand sides of these equations have a meaning for complex values of the argument. By means of them we define the functions $\sin z$, $\cos z$:

$$\sin z = \frac{e^{zi} - e^{-zi}}{2i}, \quad \cos z = \frac{e^{zi} + e^{-zi}}{2}.$$

These generalized functions are single-valued and analytic for all values of z and satisfy the same functional relations as $\sin x$, $\cos x$; e.g.,

$$\sin (z_1 + z_2) = \sin z_1 \cos z_2 + \cos z_1 \sin z_2.$$

The $\tan z$ is defined as $\sin z / \cos z$, etc.

(*c*) The Inverse Functions. The function $\log z$ shall be defined as the inverse of the exponential function:

$$e^w = z, \quad w = \log z.$$

Setting $w = u + vi$, $z = r\ (\cos \phi + i \sin \phi)$, we have $e^u (\cos v + i \sin v) = r (\cos \phi + i \sin \phi)$.

Hence $$u = \log r, \quad v = \phi + 2k\pi, \text{ and}$$
$$\log z = \log |z| + (\phi + 2k\pi)i.$$

Thus it appears that the logarithm is no longer single-valued when complex numbers are admitted to consideration. For example,

$$\log 2 = .693 \dots + 2k\pi i.$$

In a similar way each of the other inverse functions is defined. We find

$$\cos^{-1} z = i \log (z + \sqrt{z^2 - 1}),$$
$$\tan^{-1} z = \frac{i}{2} \log \frac{i + z}{i - z}.$$

From the foregoing it appears that in the domain of complex quantities the trigonometric functions can be expressed in simple form in terms of the exponential function and conversely; while the inverse trigonometric functions express themselves in terms of the logarithm. Thus the formulas of integration:

$$\int \frac{dx}{a + bx^2} = \begin{cases} \dfrac{1}{\sqrt{ab}} \tan^{-1}\left(x\sqrt{\dfrac{b}{a}}\right), & ab > 0; \\[2ex] \dfrac{1}{2\sqrt{-ab}} \log \dfrac{\sqrt{a} + x\sqrt{-b}}{\sqrt{a} - x\sqrt{-b}}, & ab < 0, \end{cases}$$

apparently in no wise akin, are seen to be equivalent in the complex domain.

6. Laplace's Equation.—(*a*) Flow of Heat or Electricity. Let the points of the boundary of a homogeneous (or more properly isotropic) conducting substance be maintained at given temperatures (for example, a steam-pipe, the interior being kept at 100° and the exterior at 0°). Then a flow of heat ensues within the conductor and the temperature at any given point approaches a limiting value, u, as time goes on. In fact, if each point were brought to this limiting temperature, it would continue there so long as the boundary conditions are maintained and we should have a steady flow. The corresponding temperature u satisfies Laplace's Equation in three dimensions:

$$\Delta u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0.$$

If in particular the solid be bounded by cylindrical surfaces whose elements are parallel to the z-axis, and if the given temperature be constant along each element, then u will evidently be constant along any line parallel to the z-axis, and we shall have in substance a two-dimensional flow, for which

$$\Delta u \equiv \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0.$$

We may conceive the solid itself in which the flow takes place as two-dimensional if we think of a thin section as cut out of the above solid by two planes parallel to the (x, y)-plane and very near together. The flat faces of this slab are then to be thought of as coated with some adiabatic substance, so that no heat can enter or leave the slab across these faces.

The electrical problem is mathematically identical with the heat problem, u being interpreted as *potential* instead of temperature. As conductor consider for example a piece of tinfoil whose edge is connected with a thick piece of copper. Let one pole of a battery be attached to the copper and the other to the tinfoil at an interior point. We thus have a point source.

The curves u=const. are called *isothermals* or *equipotential curves.* The orthogonal trajectories of these curves v=const. are the *lines of flow.*

(*b*) Flow of an Incompressible Fluid. Consider the flow of an incompressible fluid constrained to move between two parallel planes, the particles which lie in any line perpendicular to the planes at any moment always remaining in that line. If there be a function u whose partial derivatives with regard to x and y give the components of the velocity of each particle of the fluid along the axes, then u is called the velocity potential. If u does not depend on t, we have a steady flow with velocity potential, and u here satisfies Laplace's Equation.

Conversely, let u be any *harmonic function,* i.e., a solution of Laplace's Equation, in two dimensions. Then this function defines a steady flow of heat, electricity, or an incompressible fluid with velocity potential.

Let us turn now to analytic functions of a complex variable:

$$w = u + vi = f(x + yi).$$

Differentiating the first of the equations (1) with regard to x, the second with regard to y, and adding, we see that u satisfies Laplace's Equation. Hence

Theorem: Every analytic function of a complex variable defines a steady flow of heat, electricity, or an incompressible fluid.

The converse is also true. Let us first recall the condition that

$$P\,dx + Q\,dy$$

be an exact differential, namely,

$$\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}.$$

If this condition is fulfilled throughout a finite region S, then

$$\int P\,dx + Q\,dy$$

taken over the complete boundary of S will vanish. Furthermore, if S has but a single boundary,

$$\int_{(a,\,b)}^{(x,\,y)} P\,dx + Q\,dy$$

will be a function of the upper limit (x, y) alone, not of the path of integration; cf. Goursat, 'Cours d'analyse,' Vol. I, § 152. It can now be shown that, given a steady flow of heat or electricity, a possible flow results if we interchange the equipotential lines and lines of flow.

Returning now to the main question, let u be any solution of Laplace's Equation, and form the function

$$v = \int_{(a,\,b)}^{(x,\,y)} -\frac{\partial u}{\partial y}\,dx + \frac{\partial u}{\partial x}\,dy + C.$$

Then the value of the integral will be independent of the path of integration,— at least if we confine ourselves to a finite region S with a single boundary. The derivatives of this function have the values

$$\frac{\partial v}{\partial x} = -\frac{\partial u}{\partial y}, \quad \frac{\partial v}{\partial y} = \frac{\partial u}{\partial x},$$

and thus satisfy (1). Hence u and v are conjugate functions, and $u+vi$ is an analytic function of $x+yi$.

The relation here pointed out between the theory of functions of a complex variable and certain problems of mathematical physics was employed by Riemann (1851–66) as a means of investigation in the former subject, and his method has been further developed by Klein (since 1881) and others.

7. **Cauchy's Theorem.**— Let $f(z)$ be single-valued and continuous throughout a region S, and let C be a curve lying in S. The integral of $f(z)$ taken along C is defined much as a curvilinear integral is in the calculus. Let C be divided by the points $z_0 = a, z_1, \ldots, z_n = b$ into n arcs; set $z_{\kappa} + 1 - z_{\kappa} = \Delta z_{\kappa}$. Then if, as n increases, the lengths of all the arcs approach 0,

$$\lim_{n=\infty} \sum_{\kappa=0}^{n-1} f(z_\kappa)\Delta z_\kappa = \int_a^b f(z)\,dz.$$

The following theorem, due to Cauchy (1825), is fundamental.

Cauchy's Integral Theorem. Let $f(z)$ be single-valued and continuous throughout a finite region S, inclusive of the boundary, and let $f(z)$ be analytic within S. Then the integral of $f(z)$, extended over the entire boundary C of S, has the value 0:

$$\int_C f(z)\,dz = 0.$$

Writing $f(z) = u + vi$, $z = x + yi$, we have

$$\int_C f(z)\,dz = \int_C (u\,dx - v\,dy) + i\int_C (v\,dx + u\,dy).$$

But each of these latter integrands is an exact differential (§ 6), since u and v are conjugate functions. Hence, by the theorem of § 6, each integral vanishes.

By means of this theorem many real definite integrals may be computed. In fact, it was through the attempt to obtain a rigorous deduction of such formulas that Cauchy was led to his theorem (memoir of 1814). We will give one example: Consider the integral of e^{-z^2}

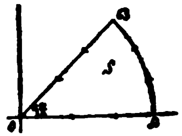


Fig. 2

extended along the boundary of the region indicated. Its value is 0. Hence

$$\left(\int_{OA}+\int_{AB}+\int_{BO}\right)f(z)dz=0.$$

Now let $OA=R$ increase without limit. The first integral thus becomes the well-known integral of the Theory of Probability:

$$\int_0^\infty e^{-x^2}dx=\frac{\sqrt{\pi}}{2}.$$

The second integral can readily be shown to approach the limit 0. In the third,

$$z=r(\cos 45^\circ+i\sin 45^\circ)=\frac{1}{\sqrt{2}}(1+i)r.$$

Hence

$$\frac{\sqrt{\pi}}{2}+\frac{1}{\sqrt{2}}(1+i)\int_\infty^0 e^{-r^2i}\,dr=0.$$

Setting $e^{-r^2i}=\cos r^2+i\sin r^2$ and separating reals and pure imaginaries, we obtain the evaluation of the Fresnel integrals:

$$\int_0^\infty \sin r^2dr=\int_0^\infty \cos r^2dr=\frac{1}{2}\sqrt{\frac{\pi}{2}}.$$

The *residuum* of a function $f(z)$ in a point a in whose neighborhood, with the exception of the point a itself, the function is single-valued and analytic, is defined as

$$\frac{1}{2\pi i}\int_C f(z)dz,$$

the path of integration C being a closed path surrounding the point a and containing no other singularity of the function. If $f(z)$ is single-valued and analytic in a finite region S except at a finite number of points lying within the region, then the sum of the residua of $f(z)$ at these points is given by

$$\frac{1}{2\pi i}\int_C f(z)dz,$$

where C refers to the boundary of S.

8. Development into a Taylor's Series.— In 1831 Cauchy extended Taylor's Theorem to functions of a complex variable and at the same time discovered a simple test for the range of values of the variable for which the series converges. Let $f(z)$ be single-valued and analytic in a region S, and let a be an interior point of S. Let K be the largest circle that can be drawn in S with a as centre so as to include in its interior no point of the boundary of S. Then, for all points z within this circle, $f(z)$ can be represented by the series

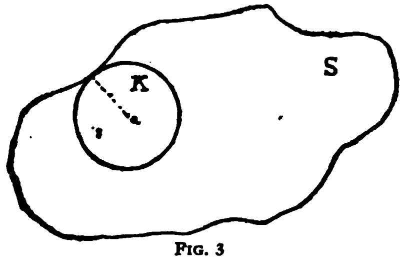


FIG. 3

$$f(z)=c_0+c_1(z-a)+c_2(z-a)^2+\dots,$$

where $$c_n=\frac{1}{2\pi i}\int_C\frac{f(t)dt}{(t-a)^{n+1}}=\frac{f^{(n)}(a)}{n!},$$

and $$|c_n|<Mr^{-n},$$

where M denotes the maximum value of $|f(z)|$ on the circumference of the circle $|z-a|=r$.

Example. Let $f(z)=(1-2\mu z+z^2)^{-\frac{1}{2}}$, where μ is a real constant numerically less than 1. Here either value of the function is continuous and analytic except where the radicand vanishes:

$$1-2\mu z+z^2=0,\quad z=\mu\pm i\sqrt{1-\mu^2},$$

i.e., at two points on the unit circle about $z=0$. Hence we can develop either value of the radical into a Taylor's series:

$$\frac{1}{\sqrt{1-2\mu z+z^2}}=P_0+P_1z+P_2z^2+\dots,$$

where the coefficients P_n depend on μ alone, and the series will converge for all values of z within the unit circle.

The proof of the theorem is based on Cauchy's Integral Formula, by means of which the value of the function $f(z)$ at any interior point of S can be expressed solely in terms of the value of $f(z)$ along the boundary, C, of S:

$$f(z)=\frac{1}{2\pi i}\int_C\frac{f(t)dt}{t-z}.$$

This formula is deduced directly from Cauchy's Integral Theorem, and is analogous to the theorem in the Theory of the Potential by which the value of a harmonic function u at any point within a region is expressed in terms of its value $U(s)$ on the boundary, and of a function peculiar to the shape of the region, namely, the Green's Function G:

$$u=\frac{1}{2\pi}\int_C U\frac{\partial G}{\partial n}ds.$$

In fact, each formula can be deduced from the other one. The whole theory of functions of a complex variable can be based on Cauchy's Integral Formula as well as on the Taylor's development.

Conversely, let

$$c_0+c_1z+c_2z^2+\dots \tag{4}$$

be any power series converging for values of $z\neq 0$. Then it can be shown that this series converges within a certain circle of radius R and (excepting the special but important case that it converges for all values of z and thus represents a so-called *integral transcendental* function of z) diverges outside of the circle. Within this circle, called the *true circle of convergence*, the series represents an analytic function and forms in fact the Taylor's (or Maclaurin's) development of this function about the point $z=a=0$.

9. Other Series.— (*a*) Laurent's Series. If $f(z)$ is single-valued and analytic within a circular ring of radii r_1 and r_2 about the point a, then $f(z)$ can be developed into a Laurent's Series:

$$f(z)=\sum_{n=-\infty}^{\infty}c_n(z-a)^n,$$

convergent for all values of z within this ring: $r_1<|z-a|<r_2$. Here

$$c_n=\frac{1}{2\pi i}\int_C\frac{f(t)dt}{(t-a)^{n+1}},\quad |c_n|\leqq Mr^{-n},$$

where C denotes a closed curve lying within the ring and encircling the point a, and M, r have the same meaning as in § 8.

(*b*) Lagrange's Series. Kepler's problem of developing a root w of the equation

$$w = a + z \sin w$$

(or more generally a function $\Phi(w)$ of this root) according to powers of z led Lagrange to formulate the following problem: To develop a root w of the equation

$$w = a + zf(w),$$

or more generally a function $\Phi(w)$ of this root, according to powers of z. He thus obtained the series that bears his name:

$$\Phi(w) = \Phi(a) + z\Phi'(a)f(a) + \sum_{n=2}^{\infty} \frac{z^n}{n!} \frac{d^{n-1}}{da^{n-1}} [\Phi'(a)f(a)^n].$$

Example: Let $f(w) = \frac{1}{2}(w^2 - 1)$,

$$w = \frac{1 - \sqrt{1 - 2az + z^2}}{z}.$$

Then $\partial w/\partial a = (1 - 2az + z^2)^{-\frac{1}{2}}$ and

$$\frac{1}{\sqrt{1 - 2az + z^2}} = 1 + \sum_{n=1}^{\infty} \frac{z^n}{n!} \frac{d^n}{da^n} \left[\frac{(a^2 - 1)^n}{2^n}\right].$$

Thus the form of the coefficients P_n in the example of § 8 is determined:

$$P_n(\mu) = \frac{1}{n!} \frac{d^n}{d\mu^n} \left[\frac{(\mu^2 - 1)^n}{2^n}\right].$$

These functions are known as Zonal Harmonics.

10. Roots and Singular Points.—A function $f(z)$ is said to have a *root* or *zero* at an interior point a of the region S of § 8 if $f(a) = 0$. It follows that $f(z)$ can then be written in the form

$$f(z) = (z - a)^m[c_m + c_{m+1}(z - a) + \ldots],$$

where m is a positive integer and $c_m \neq 0$ (unless $f(z) \equiv 0$). The point a is called a root or zero of *order* m; $f(z)$ is sometimes said to have m roots in $z = a$. A circle of definite radius can always be drawn about the point a containing no further root of $f(z)$.

If $f(z)$ is single-valued and analytic throughout the neighborhood of a point a with the exception of this point itself, and if $f(z)$ becomes infinite no matter how z approaches a, then a is called a *pole* of $f(z)$. Since $1/f(z)$ then has a zero in a, $f(z)$ can be written in the form

$$f(z) = \frac{\phi(z)}{(z - a)^m},$$

where m is a positive integer and $\phi(z)$ remains finite and different from 0 at a; $f(z)$ is said to have a pole of *order* m, or to have m (simple) poles in $z = a$.

If, however, $f(z)$ does not approach a limit when z approaches a, and does not have a pole there either, a is called an *essential singularity*. In the neighborhood of such a point Weierstrass has shown that the function comes as near as one pleases to any arbitrary preassigned value.

11. Linear Transformations.— The linear transformation

$$Z = \frac{az + b}{cz + d}, \quad ad - bc \neq 0,$$

plays an important rôle in the theory of functions. If $c = 0$, we have an *integral linear transformation*. Interpreted geometrically as a transformation of the plane into itself, it comprises as special cases:

(*a*) $Z = z + b$, i.e., a translation;
(*b*) $Z = e^{\alpha i}z$, " a rotation;
(*c*) $Z = Az, A > 0$, " a stretching.

The general integral linear transformation can be generated by a succession of these transformations.

If, however, $c \neq 0$, we need to consider one further transformation:

(*d*) $$Z = \frac{1}{z},$$

This corresponds to an inversion in the unit circle: $R = 1/r$, followed by a reflection in the axis of reals: $Y = -y$.

The general linear transformation carries circles over into circles, straight lines being regarded, as in the geometry of inversion, as circles with infinite radii. The infinite region of the plane is considered as a *point* (not, as in projective geometry, as a line), and this is the convention which it is desirable, for reasons that cannot be named here, to make in the theory of functions. We speak of *the point* $z = \infty$.—Cf. an article by F. N. Cole, 'Linear Functions of a Complex Variable,' *Annals of Math.*, Ser. 1, Vol. 5 (1890), p. 121.

12. Multiple-Valued Functions.— When in the definition of § 1 more than one value is assigned to each point of S, the first thing to be done is to group these values in such a way that they form several single-valued functions. Consider for example the function $\sqrt{z}$. Setting

$$w = Re^{\Phi i}, \quad z = re^{\phi i},$$

we have

$$R = \sqrt{r}, \quad \Phi = \tfrac{1}{2}\phi, \quad \tfrac{1}{2}\phi + \pi.$$

If now we sever the plane along a line running from $z = 0$ to $z = \infty$, say along the positive axis of reals, we can then spread out two single-valued functions each analytic in this region, namely,

$$w_1 = \sqrt{r}\, e^{\frac{\phi i}{2}} \quad \text{and} \quad w_2 \neq -\sqrt{r}\, e^{\frac{\phi i}{2}},$$

and these two functions together just exhaust the values of the multiple-valued function $\sqrt{z}$. Let us, therefore, consider two planes instead of one, each severed along the cut in question and lying one above the other like the leaves of a book, and assign the values w_1 to the points of the one plane, w_2 to those of the other. We observe, furthermore, that the values of w_1 along the upper side of the cut in its leaf and those of w_2 along the lower side of the cut in the second leaf agree with each other. Let these two edges be united, so that z, moving continuously in the surface thus formed, will pass from leaf I to leaf II without interruption when it crosses the positive axis of reals from the upper side. Similarly the values of w_1 along the lower edge of the cut in leaf I and those of w_2 along the upper edge of the cut in leaf II correspond. Hence we shall unite these two edges. The final result is a closed surface of two sheets in which the function $\sqrt{z}$ is single-valued. The sheets cut through each other along a line; but the point z in crossing this line is not at liberty to pass into either sheet. z has not come to a fork in the road, but to a switch which has already been set, and its further course is definitely determined.

The point $z = 0$ is called a *branch-point*, the cut a *junction-line*.

More generally, let

$$G(w, z) = A_0(z)w^m + A_1(z)w^{m-1} + \ldots + A_m(z) = 0$$

be an algebraic equation. Then to each value of z correspond in general m distinct values $w_1, \ldots, w_m$. Mark the points $a_1, \ldots, a_K$ (finite in number) for which this is not the case. Draw a curve C, not cutting itself, through these points and continue C from the last point to $z = \infty$. Then spread out m leaves over the z-plane and cut each leaf along C. The m values $w_1, \ldots, w_m$ of the function can now be assigned to the points of these leaves so as to form m single-valued functions analytic throughout these regions. Finally, corresponding edges of the leaves are to be connected along each of the segments into which C is divided by the points $a_1, \ldots, a_K, \infty$. The result is a closed surface on which w is a single-valued function of z. If $G(w, z)$ is irreducible, the surface will consist of a single piece, and conversely. A branch-point in which μ leaves are connected in cycle is said to be of *order* $\mu - 1$.

The surfaces here described are due to Riemann (Göttingen, thesis for the doctorate, 1851) and are known as *Riemann's Surfaces.* Corresponding to any given analytic function there can always be constructed a Riemann's surface on which the function becomes single-valued. In all ordinary cases the leaves are joined together in cycle in branch-points, and they always pass over into each other along junction lines, never merely at isolated points. See ANALYSIS SITUS.

13. Analytic Continuation.—If a function $f(z)$ be single-valued and analytic in a region S, it may happen that the function can be defined in an adjacent region S_1 in such a way that the extended function is analytic throughout the enlarged region (S, S_1). In this case $f(z)$ is said to be *continued analytically* beyond the region S into the region S_1. If S_1 overlaps S, it will in general be necessary to introduce a Riemann's surface for the extended function.

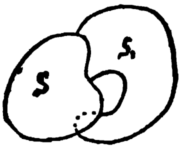


FIG. 4

Consider, for example, a function given by the power series (4). Let $z_0 \neq 0$ be an interior point of the circle of convergence K. Develop the function by Taylor's Theorem about the point z_0. The new power series, which proceeds according to powers of $z - z_0$, will surely converge within a circle tangent internally to K, and it may converge throughout a larger circle K_1. In the latter case analytic continuation is possible, the region S_1 corresponding to the part of K_1 exterior to K.

We are now in a position to complete the definition, according to Weierstrass, of an analytic function. Let $f(z)$ be analytic in a given region S. Continue $f(z)$, if possible, analytically beyond S. Repeat this step so long as it is possible to do so. The most extended function that can thus be generated out of the given function is known as the *monogenic analytic function* $f(z)$. It is uniquely determined by the values of $f(z)$ in S. Weierstrass employed the method of overlapping circles and power series for obtaining the successive analytic continuations. The function is completely defined as soon as any one of these power series, called *elements,* is known.

The rational functions and the elementary functions e^z, log z, etc., are examples of monogenic analytic functions. By an *algebraic function* is meant any monogenic analytic function which satisfies an algebraic equation, $G(w, z) = 0$, where G denotes a polynomial. Every irreducible algebraic equation in w and z defines such a function.

Two analytic functions which agree in value with each other along an arc of a curve, however short, lying wholly within their domain of definition, are identical throughout their whole extent.

It may happen that the singular points of an analytic function are not isolated, but exist in every internal of a curve (for example an arc of the whole circumference of a circle, the latter being the case with the function defined by the series

$$\sum_{n=1}^{\infty} z^{n!}$$

throughout the interior of the unit circle $|z| < 1$), so that the function is analytic up to the curve, but cannot be extended beyond it. Such a curve is called a *natural boundary.* A region of the plane into which a given function cannot be continued analytically is called a *lacunary* space.

14. Reflection in Analytic Curves.—A curve which can be represented by the equations

$$x = f(t), \quad y = \phi(t), \quad a \leq t \leq b,$$

where f and ϕ are both developable by Taylor's Theorem about every point t_0 of the above interval and where, furthermore, $f'(t)$ and $\phi'(t)$ never vanish simultaneously in the interval, is called an *analytic curve.*

Let S be a region bounded in part or wholly by an analytic curve Γ having no multiple point. If

$$u + vi = f(z)$$

is analytic in S and takes on real boundary values along Γ, then $f(z)$ can always be continued analytically across Γ. In particular, let Γ be an arc of a circle. Then the analytic continuation is effected by inverting S in this circle and assigning to $f(z)$ in the transformed points values conjugate to those in the original points. The method is fundamental in the study of minimum surfaces, and of the elliptic modular and the automorphic functions.

15. Dirichlet's Principle.—In order to show that a simply connected region S can be mapped in a one-to-one manner and conformally on a circle (§ 4), it is necessary to establish the existence of a function u which (a) is single-valued and continuous in S, (b) satisfies Laplace's Equation (§ 6) throughout the interior of S, and (c) takes on preassigned values along the boundary of S. In similar cases in mathematical physics Gauss, Thomson and Dirichlet had attempted to give a proof of the existence of such a function by making connections with a skilfully constructed corresponding problem of the Calculus of Variations. Riemann adopted this method in order to obtain his existence proofs, both for the present problem and for the case of algebraic functions corresponding to a preassigned Riemann's surface. The problem of the Calculus of Variations which matches the present problem is as follows: To find a function u which is continuous in S, together with its first derivatives, takes on the prescribed boundary values, and makes the integral

$$\int_S\!\!\int\left[\left(\frac{\partial u}{\partial x}\right)^2+\left(\frac{\partial u}{\partial y}\right)^2\right]dS$$

a minimum. If such a function exists and if, furthermore, it has continuous second derivatives, then it will satisfy Laplace's Equation within S and thus yield the desired solution. It was assumed by the mathematicians named above that the problem of the Calculus of Variations necessarily has a solution. This method of proof is known as *Dirichlet's Principle*. Weierstrass pointed out the insufficiency of the reasoning involved in the assumption to which we have just called attention. Other methods of proof were then devised by Schwarz and Neumann. Recently Hilbert has, with considerable labor, partially filled the gap in the original method.

16. **Weierstrass's and Mittag-Leffler's Theorems.**— It is always possible to form a polynomial which has n roots situated arbitrarily in the complex plane. The question presents itself as to whether this theorem can be extended to transcendental integral functions. This question Weierstrass answered in 1876 as follows: Let $a_0, a_1, \ldots$ be any set of points in the complex plane such that $\lim a_n = \infty$ when $n = \infty$. Then there exists an integral transcendental function $G(z)$ which has in each of the points a_n a zero of arbitrarily preassigned order, and does not vanish for any other value of z. The most general such function is given by the formula

$$G(z)=e^{\Gamma(z)}\mathfrak{G}(z),$$

where $\mathfrak{G}$ denotes a particular function of the class in question and Γ is a rational or transcendental integral function. This theorem has formed the point of departure for many recent researches, chiefly of French mathematicians.

Mittag-Leffler's Theorem: Let $a_0, a_1, \ldots$ be any set of points in the complex plane such that $\lim a_n = \infty$ when $n = \infty$. In each of these points let an arbitrary polynomial in $1/(z-a_n)$:

$$f_n(z)=\frac{A_1^{(n)}}{z-a_n}+\frac{A_2^{(n)}}{(z-a_n)^2}+\cdots+\frac{A_\kappa^{(n)}}{(z-a_n)^\kappa},$$

be chosen. Then there exists a single-valued function $F(z)$ analytic throughout the whole plane except at the points a_n and behaving in each of these points like $f_n(z)$; i.e., the difference

$$F(z)-f_n(z)$$

has no singularity in the point a_n. The most general such function is given by the formula

$$F(z)=\mathfrak{F}(z)+G(z),$$

where $\mathfrak{F}$ denotes a particular function of the class in question and G is an integral function, rational or transcendental.

17. **Elliptic and Abelian Integrals.**— The motion of a simple pendulum and the length of the arc of an ellipse lead respectively to the elliptic integrals

$$\int_0^x\frac{dx}{y},\ \int_0^x\frac{y\,dx}{1-x^2},$$

where $y^2=(1-x^2)(1-k^2x^2)$, $0<k<1$. If we set the first of these integrals equal to w and let x take on complex values z, then the inverse function z defined by

$$w=\int_0^z\frac{dz}{\sqrt{(1-z^2)\,(1-k^2z^2)}},$$

turns out to be a single-valued function of its argument w having two linearly independent periods (§ 18) and being analytic throughout the whole w-plane except for poles.

A generalization which now presents itself is the following: The integrand in each of the foregoing cases is a rational function of x and y, and these variables are connected by an algebraic equation. Consider, therefore, generally an algebraic equation

$$G(w,z)=0,$$

where G denotes an irreducible polynomial in w and z, and construct the Riemann's surface corresponding to it. Let $R(w,z)$ be any rational function of w and z. Then, setting w equal to the algebraic function of z defined by the foregoing equation, we have in $R(w,z)$ a function which is singled-valued and in general continuous on the above surface. If now we extend the definite integral

$$\int_{(w_0,z_0)}^{(w,z)}R(w,z)dz$$

along an arbitrary path on the surface, we have before us an *Abelian Integral*. It is obvious that the logarithm and the inverse trigonometric functions, e.g.,

$$\sin^{-1}z=\int_0^z\frac{dz}{w},\quad z^2+w^2=1,$$

are special cases of Abelian integrals. When the equation $G=0$ is of the form $w^2=f(z)$, where $f(z)$ denotes a polynomial in z of degree >4 having all distinct linear factors (or can be thrown into this form by means of birational transformations), the integral is called a ***hyperelliptic integral***.

The only Abelian integrals whose inverse function is single-valued are those which lead to the exponential (including trigonometric) and the elliptic functions. The ***Abelian Functions*** are single-valued periodic functions, not of a single argument, but of p independent variables, where p denotes what is known as the deficiency of the corresponding Riemann's surface $G(w,z)=0$. They have $2p$ periods. These functions arise as the inverse functions $z_\kappa(w_1,\ldots w_p)$, $(\kappa=1,\ldots,p)$ of a system of p equations:

$$w_\kappa=\int_{a_1}^{z_1}\phi_\kappa dz_1+\cdots+\int_{a_p}^{z_p}\phi_\kappa dz_p,$$

where the integrals $\int\phi_\kappa dz$ are p linearly independent Abelian integrals on the Riemann's surface for $G(w,z)=0$.

18. **Automorphic Functions.**— A function $f(z)$ is said to admit a linear transformation into itself if

$$f\left(\frac{\alpha z+\beta}{\gamma z+\delta}\right)=f(z),$$

where $\alpha, \ldots \delta$ are constants and $\alpha\delta-\beta\gamma\neq 0$. A familiar class of such functions are the *periodic functions.* Here the transformation reduces to a translation:

$$f(z+\omega)=f(z).$$

The most general single-valued periodic functions of a single variable z, which are in general analytic, are the *simply* and *doubly periodic functions,* i.e., those functions whose periods can all be expressed as integral multiples $n\omega$ of a single primitive period ω, or else in the form $n\omega+n'\omega'$, where ω and ω' form a primitive pair of periods. In the latter case ω/ω' cannot be a real quantity.

If the coefficients are integers and $\alpha\delta-\beta\gamma=\pm1$, we have the *elliptic modular functions.* More generally the coefficients may have non-integral values, being restricted only in such a way that the transformations form a «discrete group.» These most general functions, including the special cases above mentioned, are known as the *automorphic functions.*

19. Definite Integrals.—The Γ-function may be defined by the definite integral

$$\Gamma(z)=\int_0^\infty t^{z-1}e^{-t}dt,$$

the variable of integration t being real and positive. This integral converges only for values of z which lie to the right of the axis of pure imaginaries: $z=x+yi, x>0$. A new definite integral can be formed as follows which converges for all values of $z\neq-n$, where n denotes a positive integer, namely,

$$\int_C t^{z-1}e^{-t}dt,$$

extended over the loop indicated in the figure.

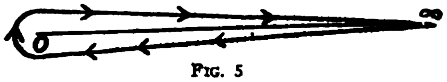


FIG. 5

It is readily shown that the second integral is equal to the first multiplied by $1-e^{2\pi iz}$ for all values of z for which the first integral converges. Hence we have generally

$$\Gamma(z)=\frac{1}{1-e^{2\pi iz}}\int_C t^{z-1}e^{-t}dt.$$

By means of this integral the Γ-function has been systematically treated.

The above is an example of a *loop integral,* i.e., a definite integral extended over a certain *loop-circuit.* Such integrals have been generalized, being extended over *double circuits,* and these latter integrals are an aid in the study of the solutions of certain linear differential equations.

20. Functions of Several Variables.—In each of n complex planes let a region $S_1,\ldots,S_n$ be given, and let z_κ be an arbitrary point of S_κ. Then the set of values $(z_1,\ldots,z_n)$ is called from analogy with the case $n=1$ a *point.* The totality of these points constitutes the *region* (S). In every point of S let a function $f(z_1,\ldots,z_n)$ be uniquely defined. The idea of the limit and of continuity can be extended at once to such a function. $f(z_1,\ldots,z_n)$ is said to be *analytic in* (S) if it is continuous in (S) and if, furthermore, when all the z_κ but one,—z_m, let us say,—are held fast, f is then analytic in S_m; this condition to be satisfied for $m=1,\ldots,n$. For brevity let $n=2$. Cauchy's Integral Formula becomes

$$f(z_1,z_2)=\frac{1}{(2\pi i)^2}\int_{C_1}\frac{dt_1}{t_1-z_1}\int_{C_2}\frac{f(t_1,t_2)dt_2}{t_2-z_2}.$$

The function can furthermore be developed by Taylor's Theorem as follows: Let (a_1, a_2) be an interior point of (S), and let K_κ be the largest circle that can be drawn in S_κ about a_κ as centre, containing in its interior no boundary point of S_κ. Then

$$f(z_1,z_2)=\sum_{l=0,\,m=0}^{\infty}c_{lm}(z_1-a_1)^l(z_2-a_2)^m,$$

where

$$c_{lm}=\frac{1}{l!m!}\left.\frac{\partial^{l+m}f(z_1,z_2)}{\partial z_1^l,\partial z_2^m}\right|_{(a_1,a_2)}$$

$$=\frac{1}{(2\pi i)^2}\int_{C_1}\frac{dt_1}{(t_1-a_1)^{l+1}}\int_{C_2}\frac{f(t_1,t_2)dt_2}{(t_2-a_2)^{m+1}},$$

and z_κ is an arbitrary interior point of the circle K_κ. We have, as in the case $n=1$,

$$|c_{lm}|\leq Mr_1^{-l}r_2^{-m},$$

where $|z_1-a_1|=r_1,\ |z_2-a_2|=r_2.$

The idea and the method of analytic continuation can be extended without difficulty to functions of several variables, and thus the *monogenic analytic function* is completely defined. For implicit functions and analytic configurations lying in hyperspace the reader is referred to the author's report in the *Encyklopädie,* §§ 44 and 47 (see below).

The following theorem is due to Weierstrass: Let $(b, a_1,\ldots, a_n)$ be an interior point of a region (S) in which $f(w, z_1,\ldots, z_n)$ is analytic. Let f vanish at this point; but $f(w, a_1,\ldots, a_n)$ shall not vanish identically. Then

$$f(w,z_1,\ldots,z_n)=\{w^m+A_1w^{m-1}+\ldots+A_m\}\phi,$$

where $\phi\ (w, z_1,\ldots, z_n)$ is analytic throughout a certain neighborhood of the point $(b, a_1,\ldots, a_n)$ and does not vanish there, while each of the coefficients $A_1(z_1,\ldots,z_n),\ldots,A_m(z_1,\ldots,z_n)$ is single-valued and analytic throughout a region including the point $(a_1,\ldots,a_n)$ in its interior. The excluded case $f(w, a_1,\ldots, a_n)\equiv0$ is also treated by Weierstrass.

21. Bibliography.— Burkhardt, 'Theory of Functions of a Complex Variable' (New York 1913); Forsyth, 'Theory of Functions' (1893); Goursat, 'Cours d'analyse' (Vol. II, 2d ed., Paris 1910–13, has been translated by Hedrick); Harkness and Morley, 'Treatise on the Theory of Functions' (1893), and 'Introduction to Analytic Functions' (1898); Osgood, 'Lehrbuch der Funktionentheorie' (Leipzig 1905–07); Picard, 'Traité d'analyse' (Vol. II, 2d ed., Paris 1901–08). For a comprehensive report on the theory of functions, including numerous historical and bibliographical references, see the author's article: «Allgemeine Theorie der Funktionen *a*) einer und *b*) mehrerer komplexer Grössen,» in 'Encyklopädie der mathematischen Wissenschaften,' Vol. II, B. 1.

WILLIAM F. OSGOOD,
Professor of Mathematics, Harvard University.

COMPLEXION, the term generally used to signify the special color or hue of a person's skin. The human skin, till the time of Malpighi, was supposed to consist only of two parts — the epidermis or outer skin, and the cutis or true skin; but that anatomist, about the middle of the 17th century, discovered between these a cellular texture, soft and gelatinous, to which the names of rete mucosum, rete Malpighi, or Malpighian tissue, have been given. He demonstrated the existence of this membrane at first in the tongue and in the inner parts of the hands and feet; but by his subsequent labors, and also by those of Ruysch and other anatomists, it was proved to exist, between the epidermis and cutis, in all parts of the human body. Malpighi, on the discovery of this membrane, offered a conjecture respecting the cause of the color of negroes. He supposed that this membrane contained a juice or fluid of a black color, from which their blackness arose. The actual existence of a black pigment has been since ascertained. The rete mucosum is of very different colors in different nations; and the difference of its color so completely agrees with the difference of their complexions, that there can be no doubt that it is the sole, or, at least, the principal seat of the color of the human complexion. Its thickness varies in different parts of the body; and the depth of its color, for the most part, is in proportion to its thickness. It is now, however, not regarded as altogether a distinct tissue, being considered rather as the innermost and newest layer of the epidermis or cuticle. The black color of the negroes is destroyed by whatever destroys the rete mucosum, as wounds, burns, etc.; the scar remaining white ever afterward. The greatest contrast in complexion is between the fair white peoples of northern Europe and the ebony-colored negro of Africa.

The nature and color of the hair seem closely connected with the complexion. In proportion to the thinness of the skin and the fairness of the complexion the hair is soft, fine and of a white color; this observation holds good not only in the great varieties of the human race, but also in albinos. Next to them in fairness of complexion is the Teutonic race, the *rutilæ comæ* (fair locks) of whom were a distinguishing characteristic even in the time of the Romans. The Celtic people are not so fair as the Teutonic, and their hair is darker and less inclined to curl; but it is perhaps more difficult than in the case of the Teutons to be sure of unmixed blood. But though the color of the hair is evidently connected with the complexion, yet its tendency to curl does not appear to be so. Many brown-complexion Celts have curled hair; the Mongolian and American races, of a much darker complexion, have hair of a darker color, but long and straight. Among that portion of the Malay race which inhabits some of the South Sea Islands, soft and curled hair is said to be met with. The color of the eye is also connected with the complexion. In the African, Professor Sommering remarks that the white of the eye is not so resplendently white as in Europeans, but rather of a yellowish brown, something similar to what occurs in the jaundice. The iris in the negroes, in general, is of a very dark color; but the iris in the Kongo negro is said to be frequently of a bluish tinge. The Teutonic tribes are not more distinguished by their fair complexion than by their blue eyes, — *cærulei oculi,* while the iris of the darker-colored Finn is brown, and that of the still darker Laplander black. The color of the eyes also follows, in a great degree, in its changes, the variations produced by age in the complexion. The most singular class of people in point of complexion are the albinos, but albinoism is not confined to the human race. An intermediate complexion is produced where children are born from parents of different races. If the offspring of the darkest African and the fairest European intermarry successively with Europeans, in the fourth generation they become white; when the circumstances are reversed, the result is reversed also. Along with the successive changes of complexion is also produced a change in the nature and color of the hair; though, in some instances, the woolly hair remains when the complexion has become nearly as fair as that of brown people in Europe. It does not, however, always happen that the offspring is of the intermediate color between that of the respective races to which the father and mother belong; it sometimes resembles one parent only, while perhaps, in the second or third generation, the color of the other parent makes its appearance. An instance has been given of a negress who had twins by an Englishman: one was perfectly black; its hair was short, woolly and curled; the other was white, with hair resembling that of a European. In another case the child of a black man and an English woman was quite black; and still more remarkable: a black married a white woman, who bore him a daughter, resembling the mother in features, and as fair in all respects, except that the right buttock and thigh were as black as the father's.

The generally received opinion concerning the varieties of complexion which are found in the different races of man throughout the globe is, that they are caused entirely by the influence of climate. Respecting the primary color of man the supporters of this opinion are not agreed. The opinion that climate alone will account for the various complexions of mankind is very plausible, and supported by the well-known facts that in Europe the complexion grows darker as the climate becomes warmer; that the complexion of the French is darker than that of the Germans, while the natives of the south of France and Germany are darker than those of the north; that the Italians and Spaniards are darker than the French, and the natives of the south of Italy and Spain darker than those in the north. The complexion also of the people of Africa and the East Indies is brought forward in support of this opinion; and from these and similar facts the broad and general conclusion is drawn, that the complexion varies in darkness as the heat of the climate increases; and that, therefore, climate alone has produced this variety. But it can be shown that the exceptions to this general rule are very numerous; that people of dark complexions are found in the coldest climates, people of fair complexions in warm climates, people of the same complexion throughout a great diversity of climate, and races differing materially in complexion dwelling near together.

1. In the coldest climates of Europe, Asia and America we find races of a very dark complexion. The Laplanders have short, black, coarse hair; their skins are swarthy, and the irides of their eyes are black. According to Crantz the Greenlanders have small, black eyes; their body is dark gray all over; their face brown or olive; and their hair coal-black.

The complexion of the Samoiedes and other tribes who inhabit the north of Asia is very similar to that of the Laplanders and Greenlanders, who are Eskimos by race. Humboldt's observations on the South American Indians illustrate and confirm the same fact. If climate rendered the complexion of such of these Indians as live under the torrid zone, in the warm and sheltered valleys, of a dark hue, it ought also to render or preserve fair the complexion of such as inhabit the mountainous part of that country; for certainly, in point of climate, there must be as much difference between the heat of the valleys and of the mountains in South America as there is between the temperature of southern and northern Europe; and yet this authority expressly assures us that «the Indians of the torrid zone, who inhabit the most elevated plains of the Cordillera of the Andes, and those who, under the 45th degree of south latitude, live by fishing among the islands of the archipelago of Chonos, have as coppery a complexion as those who, under a burning climate, cultivate bananas in the narrowest and deepest valleys of the equinoctial region.» He adds, indeed, that the Indians of the mountains are clothed, but he never could observe that those parts which were covered were less dark than those which were exposed to the air. The inhabitants also of Tierra del Fuego, one of the coldest climates in the world, have dark complexions and hair.

2. Fair-complexioned races are found in hot climates. Ulloa informs us that the heat of Guayaquil is greater than at Carthagena; and by experiment he ascertained the heat of the latter place to be greater than the heat of the hottest day at Paris; and yet in Guayaquil, «notwithstanding the heat of the climate, its natives are not tawny»; indeed they are «so fresh-colored, and so finely featured, as justly to be styled the handsomest, both in the province of Quito and even in all Peru.» According to a statement of Humboldt, in the forests of Guiana, especially near the sources of the Orinoco, «are several tribes of a whitish complexion of whom several robust individuals, exhibiting no symptom of the asthenical malady which characterizes albinos, have the appearance of true Mestizos. Yet these tribes have never mingled with Europeans, and are surrounded with other tribes of a dark brown hue.» The inhabitants of Boroa, a tribe in the heart of Araucania, are white, and in their features and complexion very like Europeans. Even in Africa darkness of complexion does not increase with the heat of the climate in all instances; the existence of comparatively fair races in this quarter of the globe is noticed by Ebn Haukal, an Arabian traveler of the 10th century, and has been confirmed by subsequent travelers.

3. The same complexion is found over immense tracts of country, comprehending all possible varieties of climate. The most striking and decisive instance of this is on the continent of America, all the inhabitants of which, with the exception of the Eskimo, exhibit the copper-colored skin and the long and straight black hair. Australia is an instance of a similar nature, though on a less extensive scale: over the whole of the island, even in the comparatively cool climate of the southern parts, the complexion of its inhabitants is of a deep black, and their hair is curled like that of negroes.

4. Different complexions are found under the same physical latitude, and among the same people. Illustrations and proofs of this have already been given. The physical latitude in which the Norwegians, the Icelanders, the Finns and the Laplanders live scarcely differs; and yet their complexion, and the color of their eyes and hair, are widely different. There is a great diversity of color and features among the Morlachs, who inhabit Dalmatia. The inhabitants of Kotar, and of the plains of Seigu and Knin, have fair blue eyes, broad face and flat nose. Those of Duare and Vergoraz, on the contrary, have dark-colored hair; their face is long, their complexion tawny and their stature tall. M. Sauchez, who traveled among the Tartars in the southern provinces of Russia, describes a race or tribe as having countenances as white and fresh as any in Europe, with large black eyes. In the south of Africa we find the Kafirs, who are of a brown or iron-gray color, and the Hottentots of a yellow color. In the island of Madagascar, according to Mr. Sibree, the observer «finds almost every shade of color from a very light olive, not darker than is seen in the peoples of southern Europe, down through all gradations of brown to a tint which although not black is certainly very dark. In the quality of the hair, too, there is a good deal of difference; the lighter-colored people having usually long, black and straight hair, while the darker tribes have, as a rule, shorter and more frizzly hair.»

Besides a Malayan olive-colored race, people with the negro complexion and features are found in the Philippine Islands; and in Java, the Hindu and Malay character may be clearly traced in the complexion and features of the two classes of inhabitants which are found in that island. In several of the Moluccas is a race of men who are blacker than the rest, with woolly hair, inhabiting the interior, hilly parts of the country. The shores of these islands are peopled by another nation, whose inhabitants are swarthy, with curled, long hair. In the interior hilly parts of Formosa the inhabitants are brown, frizzle-haired and broad-faced; while the Chinese occupy the shores.

It is observed that there are two great varieties of people in the Pacific islands; the one more fair, the other blacker, with their hair just beginning to be woolly and crisp. The first race inhabits Tahiti and other of the Society Islands, the Marquesas, the Friendly Isles, Easter Island and New Zealand; the second race peoples New Caledonia, Tanna and the New Hebrides, especially Mallicolo. If we examine the relative situation and latitudes of these islands on a map, we shall be convinced not only that darker complexioned people are found where the climate is comparatively colder, but that the same complexion is found under very different latitudes. It is not meant to be denied that a burning climate will render the complexion very dark, and that a climate of less extreme heat will bronze the complexion of the fairest European; but there are some material points in which the dark complexion of the Caucasian, or naturally fair-skinned variety of mankind, caused by climate, differs from the dark complexion of all the other varieties of the human race.

1. The offspring of the Caucasian variety is born fair; the offspring of the other varieties is

born of the respective complexion of their parents. Ulloa informs us that the children born in Guayaquil of Spanish parents are very fair. The same is the case in the West Indies. Long, in his history of Jamaica, expressly affirms «that the children born in England have not, in general, lovelier or more transparent skins than the offspring of white parents in Jamaica.» But it may be urged that this is not the case with respect to the other nations of the Caucasian variety, who have been settled in warm climates from time immemorial, and that the question ought to be decided by the Moors, Arabians, etc. Their children, however, are also born fair complexioned, as fair as the children of Europeans who live under a cold climate. Russell informs us that the inhabitants of the country round Aleppo are naturally a fair complexion, and that women of condition, with proper care, preserve their fair complexion to the last. The children of the Moors, according to Shaw, have the finest complexions of any nation whatsoever; and the testimony of Poiret is directly to the same effect. «The Moors are not naturally black, but are born fair, and when not exposed to the heat of the sun remain fair during their lives.»

2. Individuals belonging to the Caucasian variety, that inhabit warm countries, preserve their native fairness of complexion if they are not exposed to the influence of the climate; while there is a uniform black color over all the parts of a negro's body. The hue which Europeans assume is the same, though the tinge may be lighter or darker, whether they settle in Africa, the East Indies or South America. They do not become, like the natives of those countries, black, olive-colored or copper-colored; their complexion merely resembles that of a tanned person in this country, only of a darker tinge. The negroes that are settled in the West Indies or America do not assume the copper color of the Indians, even though a milder climate may have some effect on the darkness of their complexions. The children of Europeans, of negroes and of Indians are all born, in America, of the same reddish hue; but in a few days those of the negro begin to assume the black complexion of their parents, those of the Indian the copper complexion, while those of the European either continue fair, if kept from the influence of the sun, or become tanned; not black like the negro, or copper-colored like the Indian, if exposed to its influence. Europeans who settle in Canada, or in the northern parts of America, where the climate resembles that of their native country, do not assume the complexion of the Indians, but continue fair like their ancestors. The same observation may be made respecting the Russians who are settled among the Mongolian variety, in those parts of the Russian Empire in Asia, the climate of which resembles the middle or northern parts of European Russia. Indeed the wide extent of country over which the Mongolian variety is spread, including the extreme cold of Lapland and the north of Asia, the mild temperature of the middle parts of that continent, and the warmth of the southern parts of China, is in itself a proof that dark complexion does not arise either from the influence of heat or cold.

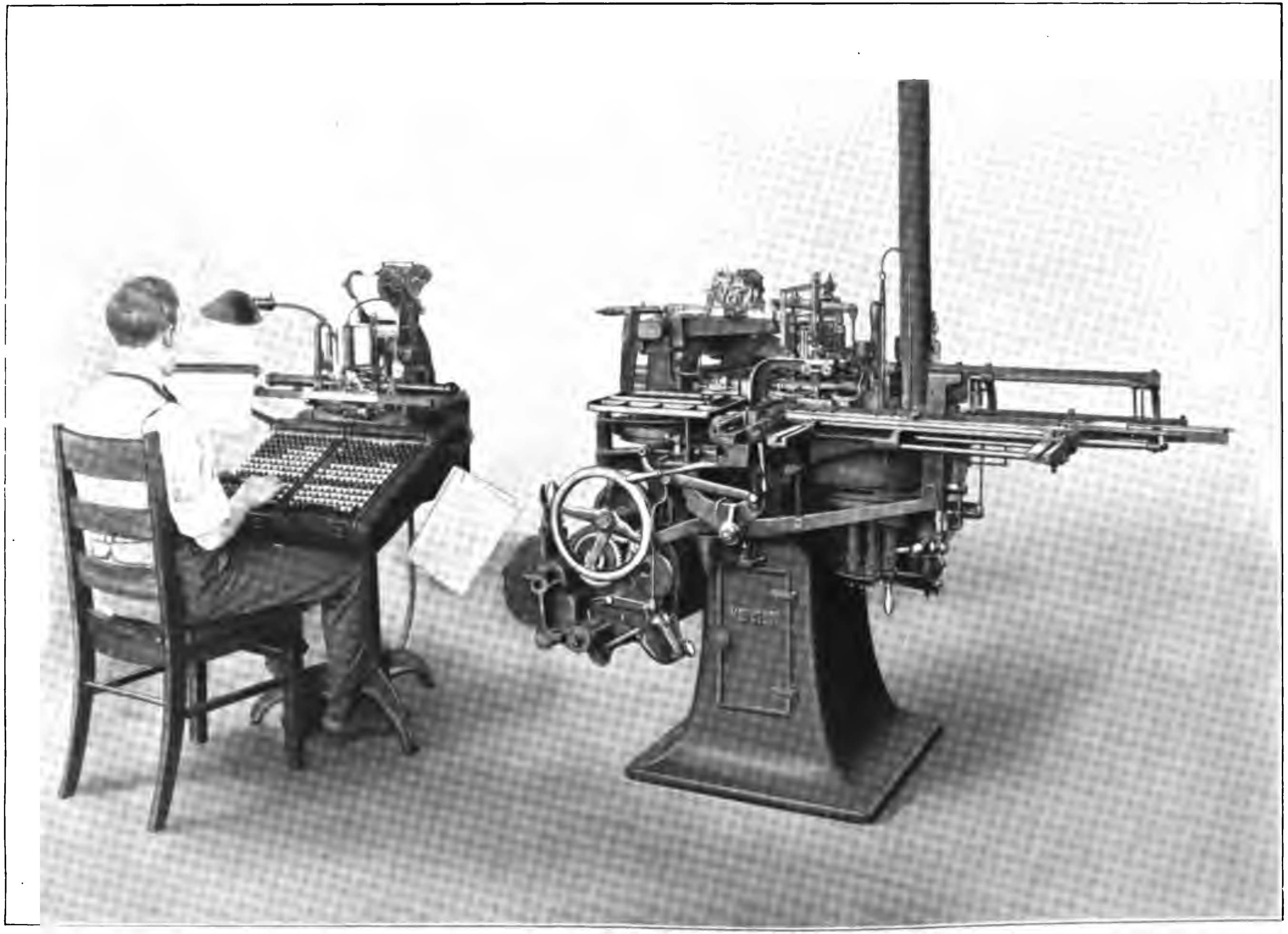
Lastly, radical varieties of complexion are always accompanied with radical varieties of features. We do not find the olive color of the Mongolian variety with the features of the Malay; nor the brown color of the Malay with the features of the Mongolian; nor the black skin of the Ethiopian variety, or the red color of the American, united with any set of features but those which characterize their respective varieties. It, however, by no means follows that the hypotheses of different races having been originally formed must be adopted, because climate is not adequate to the production of the radical varieties of complexion which are found among mankind. Man, as well as animals, has a propensity to form natural varieties; and the variations may in process of time involve all the tissues so as to yield permanent differences in color and quality of hair, color of skin, size and form of bones, especially those of the skull and limbs. See EPIDERMIS; HISTOLOGY; MALPIGHI; RACES AND NATIONS.

COMPLINE, the last or seventh of the daily canonical hours in the Roman Catholic breviary; the complement of the Vespers or evening office. Saint Benedict, in the 6th century, added Compline to the hours, thus making the number seven, answering to the praises of which the psalmist speaks of «seven times a day.» Matins and lauds were classed as one hour.

COMPLUTENSIAN POLYGLOT, the earliest complete polyglot edition of the Bible compiled and printed in Alcolá. It was made by seven scholars under the auspices and at the expense of Cardinal Ximenes. It was begun in 1502, and finished in 1517, but was not actually published till 1522. It consists of six folio volumes. In the Old Testament, on the left hand page, are the Hebrew original, the Latin Vulgate and the Greek Septuagint; and on the right hand page, the Vulgate, the Septuagint, with Latin translation above, and the Hebrew, with primitives belonging to that language on the outer margin. At the lower part of the page are two columns used for a Chaldee paraphrase and a Latin translation. The Greek Testament, constituting part of the Complutensian Polyglot, was the first complete edition of that part of Scripture printed.

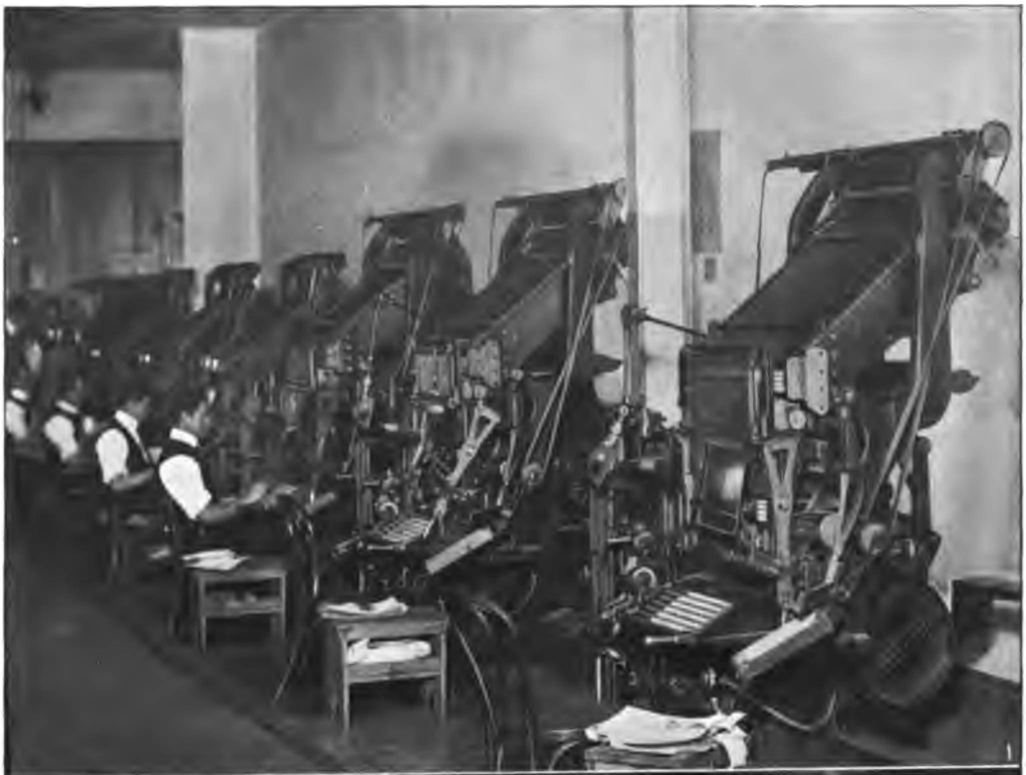
COMPOSING-MACHINES, a general title for all classes of machines that compose or set either type or matrices, arranging them in lines and columns for printing. There are four prominent types of these: (1) Those that set matrices in line and cast therefrom a solid line or slug, as the Linotype, Intertype, Linograph and Monoline; (2) those that cast and set type, as the Monotype and Graphotype; (3) those that set and distribute ordinary founders' type, these being the only ones properly styled typesetting machines, as the Thorne (or Unitype), McMillan, Empire, Dow, Fraser, Kastenbein, etc.; and (4) those that impress male dies into soft material and cast lines from these impressions.

Historically, the type-setting machine comes first, William Church of Connecticut devising a machine, which was patented in England in 1822, that was the first practical effort in this direction. He employed a keyboard, and stored the type in channels. From 1842 to 1872 there were 57 United States patents granted on composing machines, and from 1822 to 1872 a like number were patented in Great Britain. The



THE COMPLETE MONOTYPE — BUILT ON THE UNIT SYSTEM

COMPOSING MACHINES



1 Model 9 Linotypes, Fairchild Press, New York

2 Composing-room, Public Ledger, Philadelphia, Pa.

most noteworthy of these were the Mitchell and the Alden machines in the United States, and the Kastenbein, Hattersley and Fraser machines in England. These machines all came into use during the period between 1853 and 1872, and a few may still be found in operation in England. The difficulty with all of them seems to have been that they required several persons to operate each machine, and that the consequent cost was very nearly the same as for composition by hand. From 1872 up to 1880 there were invented or constructed over 50 different machines designed to supersede the compositor, practically all of which failed of commercial success. During the period between 1880 and 1890 the Thorne type-setting machine, originating in Connecticut, came into considerable use, being employed by many newspapers throughout the United States, and beginning to find a market abroad. During this period the Burr and McMillan machines also found some sale in the United States, and the Fraser, Hattersley and Kastenbein in England and Germany. In 1898 the Thorne was remodeled and renamed the Simplex, and later the Unitype.

Of all the machines devised for setting founders' type, the Unitype was most successful, but its manufacture was practically discontinued about 1914. The types are contained in 90 channels, set radially in the periphery of an upright cylinder. As the operator fingers the keys, the types called for are pushed out of the lower ends of the channels and carried around on a circular raceway to the point where they are brought into line. A second operator draws to him from the composed type thus emerging enough to form a line of the desired length. This he puts in the galley and justifies, or spaces out to length, by hand. The leads, or spaces between lines, are also inserted by this operator. The type is distributed by an upper grooved cylinder, this being performed automatically in the later machines. In the last models of this machine one operator did (or could do) all the work.

The Empire machine, first known as the Burr, was a modification of the Kastenbein. It was produced in New York, and required three operators. It therefore fell into disuse as the one-man machines became common. Nickel type was employed, and a machine would handle only one body size of type.

The McMillan machine, developed in Ilion, N. Y., was provided with automatic justification, thus dispensing with the labor of one operator. The distributor was a separate machine, operating quite simply at a speed of about 10,000 ems an hour. These machines were used for some years by the New York *Sun* and the DeVinne Press.

The Cox type-setting machine attracted considerable notice in the printing trade in Chicago and New York in 1898. The most unique feature of Cox's machine was the employment of crimped or corrugated spaces made of lead. The line was overset in length, and then squeezed down to measure by compressing the corrugations. This justification was satisfactory in some respects, but the crimped spaces created difficulty in many others, and its use was abandoned.

The Calendoli type-setting machine, developed in France by a priest of that name, attracted much attention because of the wonderful claims made for its speed. Though exploited for several years, it was never perfected for the market. It employed short types grooved so as to slide on rails, and the keyboard had numerous combinations to enable the operator to strike whole words or syllables at a single motion of the hand.

There was exhibited at the Pan-American Exposition in Buffalo, in 1901, a one-man typesetting machine that appeared to work successfully. It was the invention of Alexander Dow, and handled founders' type, being adapted to use the several sizes in one machine. The justification or spacing out of the lines was entirely automatic, requiring no thought by the operator. Had this machine been brought out at an earlier date, doubtless it would have secured a large sale.

Among other composing-machines that have been built in the United States, and attracted the attention of the printing trade at one time or another, are the Converse, projected about 1894, which did good work, but was obstructed by previous patents; the Paige, on whose development nearly $2,000,000 was spent, and which proved too costly to construct for the general market, the two machines built being now stored with Cornell and Columbia universities as mechanical curiosities; the St. John Typobar, consisting of cold-pressed metal clamped on a steel base, to form a line; the Lagerman Typotheter or Chadwick, a little machine for enabling a compositor to set type with both hands; the Johnson, which justified the lines by sawing a space of the required width; the composite type-bar machine, in which short, notched type were transformed into a line or type-bar by casting metal around their bases and between them; the Sears, in which dies were impressed in a block of wood, and a slug cast from the matrix thus formed; the Risley and Lake, in which the type were impressed in a soft sheet like blotting paper, and a stereotype taken after a quantity had been thus impressed, and the Heath Matrix Typograph, of the same class; and the Goodson Graphotype, which resembled the Monotype, but was much smaller, employing only 100 characters. The Graphotype was later rebuilt, but failed to find commercial sale.

The Scudder Monoline machine produces a slug like that of the Linotype, and was barred out of the United States as an infringing machine. It was much smaller than the Linotype and did a more restricted class of work. Early in the present century it passed into the hands of the Mergenthaler Linotype Company, and was never placed on the American market.

The Linotype is a machine designed to do the work of both type setting and type casting, by substituting for lines of individual type metal bars or slugs with raised letters on one edge. These bars, when arranged in page form, have the same appearance as pages of separate type and may be used either to print from direct or to produce stereotype or electrotype plates in the usual manner. The machine will produce type faces of any kind desired, from 5 to 36 point, some up to 60 point; requires but one operator, and gives a product equal to five or six hand compositors, furnished with ordinary type.

The Linotype was invented in 1885 by Ottmar Mergenthaler, a German by birth, then living in Baltimore, and first put into practical use by the New York *Tribune* in 1886. Since then it has come into general use by newspapers and printing offices throughout the world.

The machine contains as fundamental elements several hundred brass matrices. Each matrix consists of a flat plate having in one edge a female character or matrix proper, and in the upper end a series of teeth which are used for distributing the matrices to their proper places in the magazine of the machine. Matrices are also made having two characters, Fig. 1, as for instance, a Roman and Italic letter, either of which may be used at will. There are in the machine a number of matrices for each letter, and also matrices representing special characters and spaces.

The general organization of the machine is shown in outline in Fig. 2. A represents an inclined fixed magazine, containing channels in which the assorted matrices are stored and through which they slide, entering at the upper and escaping at the lower end, one at a time. Each channel in the magazine has at the lower end an escapement B, connected by a rod C with a finger key D, representing the letter or character of the matrices in the corresponding channel. There is a key for each character, and also keys for quads and for the wedge spacers.

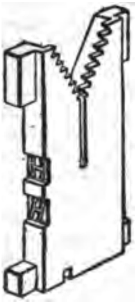


FIG. 1

The operation of the various keys results in the selection of the matrices and spacers and their collection in assembler G, until it contains all the characters to be represented in one line of print. After the line is thus composed, it is transferred mechanically, through the path indicated by dotted lines in Fig. 2, to a position in front of a mold or slot extending through the wheel K, from its front to its rear face. This mold is of the size and shape of the slug or line of type required, and it determines both the measure and the body of the line. While the line is in place in front of the mold, the wedge spacers are pushed up through the line, which is instantly and exactly justified thereby.

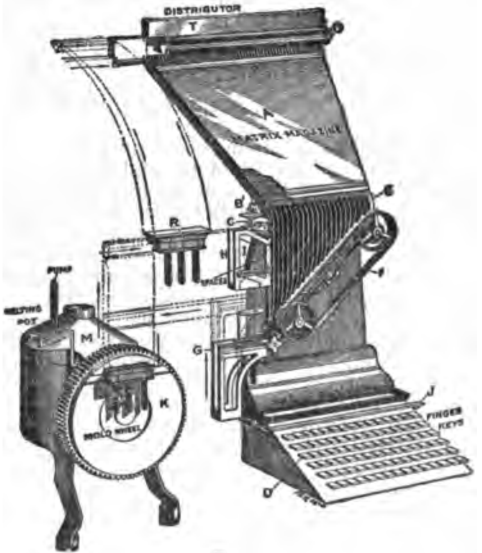


FIG. 2

Behind the mold, there is a melting pot M, heated by flame from a gas, gasoline or electric heater. After the matrix line is in place against the front of the mold, as shown in Fig. 2, a pump forces the molten metal through the pot mouth into the mold, against and into the characters in the matrix line. The metal instantly solidifies, forming a slug having on its edge raised characters formed by the matrices. The slug is then automatically removed from the mold, being trimmed to the proper length and thickness by knives. The line is then lifted from the mold and shifted laterally, until the teeth in the upper end of the matrices engage the horizontal ribs on a bar which rises, as shown by dotted line at R, lifting the matrices to the distributor at the top of the machine. The matrices pursue a circulatory course through the machine, starting singly from the bottom of the magazine, passing thence to the line being composed, thence to the mold, and finally back to the top of the magazine. This circulation permits the operations of composing one line, casting from a second and distributing a third to be carried on concurrently, and enables the machine to run at a speed exceeding that at which any operator can finger the keys. There are a dozen or more models of Linotypes in present use with a wide latitude of accomplishment. The modern models handle all type bodies from 5 point to 36 point, and assemble matrices from all magazines in one line. All machines set from 4 to 30 ems pica measure. Wider measures are obtained by assembling two or more slugs end to end. The later models have many added conveniences, and the larger machines carry two or more simultaneously acting distributors. From one to four interchangeable magazines are supplied with individual machines. Each magazine contains two-letter matrices representing 180 characters. On models 16 and 17, each having two magazines, the mere touching of a key brings either magazine into operation, rendering available 360 characters from one keyboard of 90 keys. In other models an auxiliary magazine is added with keyboard of 28 keys representing 56 characters, making a total of 416 characters in the machine.

The quadruple magazine Linotype carries eight faces, and gives the operator 720 characters from one keyboard. In 1915 the quadruple magazine head-letter machine was brought out for setting newspaper display heads in 48-, 54- or 60-point. It will be apparent that the modern machines can set the great majority of advertising and display composition, as well as the straight body reading matter, to which they were originally confined. Among recent improvements is an electrically heated metal-pot for heating the metal. This not only reduces the nuisance from lead fumes, but permits extremely close regulation of the temperature of the metal. In 1918 there were over 35,000 Linotypes in actual use all over the world.

The Monotype Composing Machine, type-and-rule caster, is so named because it casts each character on a separate body and automatically assembles them into lines and columns ready for the press. The system consists of two separate mechanisms, a keyboard and a casting machine, frequently looked after by one operator. The equipment is arranged to make production continuous, for both keyboard and caster are busy on the same job, but should either be temporarily stopped it does not interfere with the other, which keeps right on producing. The composition is done on the keyboard, which perforates the paper controller ribbon for the casting machine. This keyboard, consisting of 225 keys, has the same arrangement of characters for every alphabet as any standard typewriter. The keys are coupled by means of keybars with valves, which admit air beneath small pistons, which in turn drive the punches through the paper controller ribbon when a key is depressed by the operator. When the key is released, the punches withdraw from the paper and the controller ribbon feeds forward ready to receive the perforations for the next character. The punches are so arranged that certain combinations of perforations across the paper ribbon will position the matrix for the desired character over the mold at the casting machine.

In addition to the key and perforation mechanisms, the keyboard has a counting and justifying mechanism. The counting arrangement counts the width of each character as struck and adds it to the width of the characters previously struck in the line, so that the operator can tell at a glance just how much has been put into the line and how much space still remains. The justifying mechanism consists of a pointer which rises one notch each time the space bar is struck, to put a justifying space between words, and a cylinder (the justifying scale) which revolves automatically when the operator has put sufficient characters and spaces in the line to bring it within four ems of the end of each line. The surface of this scale is divided into small rectangles, each containing numbers which refer to the justification keys on the keybank. The keys corresponding to the two numbers indicated by the pointer are struck by the operator, when sufficient characters have been put in the line, and the perforations produced by these keys set the wedges at the casting machine to produce spaces the correct width to exactly justify the line.

The casting machine is entirely automatic in its operation and is controlled by the controller ribbon perforated at the keyboard. Two hundred and twenty-five matrices are carried in the matrix case; and, for different combinations, characters may be substituted, or the matrix case removed and a new case inserted in the machine. The face of the type is cast in the matrix, but the body of the type is cast in the mold on which the matrix seats while the type is being cast. The type comes out on the casting machine in automatically justified lines, as previously described, and these lines are assembled on an ordinary galley ready for the make-up man. It composes type in any measure up to 60 picas and in sizes from 5- to 24-point; when required, measures up to 120 picas may be composed at the keyboard. The duplex keyboard unit composes simultaneously the same matter in two different faces, point, sizes and measures; the same keystroke that produce the ribbon for magazine columns in 8-point, for example, also produce the ribbon for the same matter in 10-point for book pages, etc.

When operated as a type-and-rule caster, the Monotype casts type for the cases, borders and space material, both high and low, in sizes from 5- to 36-point. An ingenious new unit casts rules and both high and low leads from 2- to 12-point in continuous strips, and automatically cuts them to any required measure from 6 picas to 25 inches in length.

The versatility of the Monotype and the ability to supply practically everything needed in the composing room has made possible the non-distribution system now in use in many newspaper and book and job printing offices. The machine-set matter as well as the hand-set matter, when used, is simply pushed off the imposing stone into the melting pot and recast into new material for every job — type, borders, leads, slugs, etc.— this new method proving more economical than distribution by hand for re-use. The Monotype thus, while a composing machine, also brings to the printing office a practicable, small type foundry which supplies the greater part of the material needed in the composing room.

The Intertype composing machine, introduced in 1913, is manufactured on the expired patents of Ottmar Mergenthaler, combined with many modern improvements. The operator manipulates a keyboard of 90 keys, and matrices are arranged in lines, automatically spread to column measure, and carried to the mold, where a line-slug is automatically cast, while the matrices are returned to their original position by an automatic distributor. Either the matrices supplied by the manufacturer or linotype matrices may be used. One standard machine is built, on the unit principle, to which every improvement can be added by the purchase of more units. Thus the purchaser of a low-priced machine does not have to discard it to secure the conveniences of the higher-priced machines. From one- to three-magazine machines are made, and the one-magazine machine is readily changed into a three-magazine outfit, which will supply 540 characters from the one keyboard. A simple lever movement brings a new magazine to operating position. The Intertype is remarkable for its scientific design and the small number of parts used in its construction; the escapement has only two parts. All Intertypes produce from 5 to 36 point body, and 5 to 30 ems pica measure.

The Linograph machine is manufactured in Davenport, Iowa. It is very similar to the 1900 style of Linotype, plus a number of modern additions. It is designed to supply the needs of the small newspaper desiring a low-priced machine. The Stringer composing-machine supplies a product either in single type or in line-slugs, at the choice of the operator. It was brought out in England in 1914, and is not yet in general use. Several inventors have tried to produce a one-man machine that would cast and set single type at one operation, at a speed commercially profitable. Such a machine is theoretically possible. The Goodson, Wicks, Pierson and other type-casting and setting machines have been developed more or less experimentally, at great expense, but have not found general sale. The Wicks machine cast type at a speed of 60,000 an hour, and was used for some years on a London newspaper.

Consult John S. Thompson's 'The History of Composing Machines,' C. H. Cochrane's 'Modern Industrial Progress' and the files of the *American Printer* and *Inland Printer*.

Charles H. Cochrane,
Of the Staff of Newspaperdom.

COMPOSITÆ (Lat. «compound,» «put together»), a family of dicotyledonous plants, the greatest order in the vegetable kingdom, usually herbaceous in temperate and colder climates and shrubby in dry and hot regions, and seldom, apparently only in tropical zones, growing as trees. The leaves are never accompanied by stipules; they most commonly are alternately arranged, and sometimes opposite or whorled. But the true mark of the order is the compound flower, from which it gets its name and which makes it one of the simplest orders to identify, the daisy or aster being the commonest type and the name aster family or sun-flower family being sometimes used. The true blossom is a head made up of many florets, flat as in the aster or approaching a conical shape as in the black-eyed-susan. This head is set in an involucre of leafy bracts, which to the lay observer resemble petals and give the compound flower the appearance of a single bloom. The calyx, joined to the ovaries, crown them, save in a few cases, with the pappus, which is usually hairy, toothed or bristly, and coming to maturity at the time of fruition frequently furnishes the seed with a sort of wing facilitating dispersion by the wind. The corolla, tubular, ligulate or labiate, divides into five lobes at the summit. The anthers are united in a tube by which the five stamens are also joined into one. The ovules at fruition dry up and become achenes (q.v.). Among the florets, which naturally fall into two classes, the fertile ones of the disc and the sterile ones of the ray, grow bracts called paleæ or chaff, except where the receptacle is naked. The classification of the order *Compositæ* is difficult, if for no other reason because it contains about 11,000 genera and more than 1,000 species, that is, about one-tenth of the higher vegetable forms. The simplest division is into *Liguliflora,* with all florets ligulate or strap-shaped, and *Tubulifloræ,* with disc florets not ligulate. The latter class is by far the larger. The *Liguliflora* contains only the one tribe, *Cichorieæ,* often classed as a distinct family, of which the food-plants, lettuce, salsify and chicory, are the best known members. In the other sub-order, the *Tubulifloræ,* are 12 tribes: *Vernonieæ,* with 41 genera, iron-weed being a common member; *Eupatorieæ,* with 35 genera, including the medicinal plants, ayapana, bitterbush, boneset and hemp agrimony; *Astereæ,* including the typical asters, dahlias, etc.; *Heliantheæ,* with the artichokes and other tuberous plants; *Inuleæ,* of which elecampane may be mentioned as an example; *Helenieæ,* sneezeweed being an American member; *Anthemideæ,* including the different varieties of camomile, the chrysanthemum and the marguerite; *Senecioneæ,* with four sub-tribes, and the old-fashioned foliage plant called dusty miller; *Calendulaceæ,* including the marigolds; *Arctotideæ,* with only one genus, occurring in South Africa and Australia; *Mutiseæ,* another scantily diffused tribe; and *Cynareæ,* including the thistles.

The *Compositæ* may be regarded, especially from a consideration of their flowers, as the highest order in a scale of vegetable evolution. Their peculiarly efficacious methods of pollination, this process being simplified by the close set florets which permit of insect-fertilization or wind pollination, and by a peculiar action of the style which in the individual flower pushes itself in the way of wind or insect. Dissemination also is highly developed, there being three prominent types, the plumose pappus, as in dandelion and thistle, which is wind-sown; the hooked achenes, as in the burdock and tickseed, which fastens to passing animals, and the gummy seeds of other plants, which are dispersal adaptations. On the order in general consult Bentham, 'On the Classification, History, and Geographical Distribution of the Compositæ' (1873).

COMPOSITE ORDER, a term denoting the last of the five orders of architecture. As its name implies, it is composed of two orders, the Corinthian and the Ionic. Its capital is a vase with two tiers of acanthus leaves, like the Corinthian; but, instead of stalks, the shoots appear small, and adhere to the vase, bending round toward the middle of the face of the capital; the vase is terminated by a fillet, over which is an astragal crowned by an ovolo. The volutes roll themselves over the ovolo, to meet the tops or the upper row of leaves, whereon they seem to rest. The corners of the abacus are supported by an acanthus leaf bent upward; and the abacus itself resembles that of the Corinthian capital. In detail, the Composite is richer than the Corinthian, but it is less light and delicate in its proportions. Its architrave has only two fasciæ and the cornice varies from the Corinthian in having double modillions. The column is 10 diameters high. The principal ancient examples of this order are the temple of Bacchus at Rome, the arch of Septimius Severas. The Composite order differs from the Corinthian in the design of its capital and in no other way. The capital is made up of the foliage of the Corinthian and the volutes of the Ionic capital. Most of the Byzantine capitals were based on the Roman Composite in its varying forms. The Italians, in their attempts to follow the ancient Roman Composite, have vitiated the true Composite forms, and in this they have been followed by some famous foreign architects, notably by Imigo Jones.

COMPOSITION, in law, an agreement between debtor and creditor or creditors, by which the latter accepts part of the debt due in satisfaction of the whole. Composition also bears the secondary meaning of the sum or rate paid or agreed to be paid in compounding with creditors.

COMPOSITION OF FORCES AND MOTIONS. See Mechanics.

COMPOST, any mixture of decomposed organic matter with earth, used as a fertilizing compound. A compost is most frequently made by alternating layers of sods and stable manure in piles three or four feet thick and sprinkling them with lime, kainit and some potash salt, such as the sulphate or muriate. After several weeks, during which they are kept moist by applications of water or, better, liquid manure, they are cut with a spade and turned over to form a new heap in which the various substances are mixed as much as possible. They may be turned several times to ensure the decay of the various organic materials. By varying the proportions of manure and fertilizer to soil and organic matter composts may be obtained suitable for various purposes; rich ones for succulent crops and less rich for plants that must be kept stocky. In a general way the term compost is also used for any heap of decaying vegetable or animal matter which is to be used as a manure. Thus stable manure and litter become compost heaps; also the piles of leaves, etc., from which leaf mold is obtained for greenhouse use. Directions for making composts for particular kinds of plants may be found in all books on gardening, floriculture, etc., and many of the works dealing with manures and manuring also devote space to composting. A mixed dish is called a compost or compote; and the term is also applied to a composition for plastering the exterior of houses. In this latter use it is often popularly contracted to compo.

COMPOSTELLA, kŏm-pŏs-tā'lą, Order of Saint James of, an order of Spanish knights formed in 1175 to protect from the Moors the Christian pilgrims who had flocked in vast numbers to Santiago de Compostella Galicia, Spain, where the relics of Saint James the Great were preserved. At first there were but 13 members of the order, but it grew rapidly in numbers and they became not only strong defenders of the relics of their patron but champions of Christianity against the invasion of the Moors. In time this order attained great wealth, thereby exciting the jealousy of the Crown, which succeeded in securing the grand-mastership in 1522, after which the order rapidly declined. On the overthrow and expulsion of the Moors from Spain in 1492 the excuse for the existence of the Society ceased, and the following year Ferdinand and Isabel, who then ruled Spain as joint sovereigns, took possession of the abbeys, villages, towns and landed property of the Compostella order and held them until 1522, when a papal bull vested the grand-mastership permanently in the Crown.

COMPOUND ALCOHOL, rectified spirits to which has been added one or more flavoring ingredients. They are called also compounds. The chief compounds are gin, British rum, British brandy, and some grades of American whisky, cordials and liqueurs, such as curaçao, lovage, cherry brandy, noyeau, rum shrub, etc., are also denominated compounds. These are prepared by adding to clean rectified spirits various essences or oils and sweetening with sugar or syrup. Sweetened compounds usually contain from 20 to 35 per cent of proof spirit.

COMPOUND AMMONIAS, or AMINES, a large and very important class of complex substances derived from ammonia by replacement of the hydrogen with an organic radical. They are termed primary, secondary or tertiary, according as one-third, two-thirds or the whole of the hydrogen is replaced by an organic radical. They are found in nature in the vegetable alkaloids and among decomposition products of animal and vegetable organisms. They are all basic in function, combining with acids to form crystalline salts. They have an alkaline reaction. Some of the lower members of the group are gases and volatile liquids, generally inflammable, with a pungent fishy odor. As the molecular weight increases they become more stable, and the higher members are solid and odorless. They are of great importance in the investigation of the constitution of various organic bodies. See AMINE.

COMPOUND ANIMAL. See COLONIAL ANIMALS.

COMPOUND DUTIES. See DUTY.

COMPOUND LOCOMOTIVES. See LOCOMOTIVE.

COMPOUND STEAM-ENGINE. See STEAM-ENGINE.

COMPOUNDING A FELONY, the act of accepting from a felon, by the person aggrieved, a return of the goods, a consideration or a reward, on the express condition that he will not prosecute the felon. The mere failure to prosecute a person committing a crime is not, even if the goods are returned, compounding a felony; but the essence of the action is the agreement not to prosecute for a consideration of any kind. It is usually illegal to accept the return of money or goods stolen or to hide or condone other illegal acts performed or procured by the offending party or another, in his interest, upon a promise of immunity from prosecution or the withdrawing of evidence. The person aiding the felon is an accessory to the crime and can be prosecuted, although the person committing the crime has never been tried. In English law, to advertise a reward for the return of stolen goods renders the advertiser liable to a fine.

COMPRESSED AIR. Compressed air has a wide application in the various branches of mechanical engineering and in the arts and manufactures. As compared with steam, compressed air transmission of power is valuable and convenient because (a) its loss in transmission through pipes is relatively small, (b) the question of the disposal of exhaust steam underground is avoided and (c) the exhausted air is a help in ventilation. Although electricity has become a rival of compressed air in many branches of work, their spheres of usefulness are not identical. The first cost of an electric plant is lower than that of an equivalent compressed air plant; but a point is soon reached where compressed air transmission becomes the cheaper. In recent years the principles of air compression have become better understood and a substantial improvement has taken place not only in the design of the compressors themselves, but also in the installation of pipe lines and in the operation of the machines. In the production, transmission and employment of compressed air a greater total efficiency is now realized than was formerly thought possible.

Cooling During Compression.— If air at atmospheric pressure and 60° F. could be compressed to 100 pounds gauge pressure and all the heat due to the work of compression taken away as fast as generated, so that the temperature during compression would remain constant, the mean effective pressure during one stroke of the air piston would be 30.2 pounds. If, on the other hand, none of the heat due to the work of compression was taken away the mean effective pressure during the stroke would be 41.6 pounds and the terminal temperature would reach 485° F. As the power required for compression is directly proportional to the mean effective pressure, it will be seen that the additional power required in the latter case is

37½ per cent. In practice neither extreme is reached, for it is impossible to completely cool the air during compression, and, on the other hand, some of the heat of compression will be radiated; but the lower extreme is the ideal, and the nearer it can be approached the more economical the compressor will do its work.

Heat of Compression.— Various plans for taking away the heat generated in compression, such as injecting a spray of water into the cylinder, circulating cooling water through the piston and around the heads and cylinder barrel, etc., have been tried. The use of the cooling spray, or so-called «wet compression,» has long since been abandoned, as has also the plan of circulating water through the piston, for the disadvantages more than offset the advantages. Cylinder heads and barrels are still water-jacketed, not so much on account of the heat that can be taken from the air as to keep the cylinder cool enough for proper lubrication. The most effective means for taking away the heat of compression and reducing the amount of power required consists of dividing the compression into two or more stages, depending upon the terminal pressure, and cooling the air as much as possible between stages by means of suitable cooling apparatus; the water-jacketing of the cylinders being retained for the reason above stated. Where the work of compression is done in two or more cylinders, it is customary to so fix the ratio of cylinder volumes as to divide the work equally between the cylinders. By using two-stage compression and cooling the air between the stages to its initial temperature (60° F.), without considering the cooling by water-jacketing, it is possible to reduce the mean effective pressure to 35.5 pounds as compared to 41.6 pounds, which is equivalent to a saving of 15 per cent. At the same time the terminal temperature will be only 245° F. instead of 485° F.

Clearance.— Another factor in compressor design is the clearance in the compressor cylinders. It is not possible to run a compressor without some space between the piston and cylinder head at the end of the stroke, and in addition to this space there is the volume of the inlet and discharge passages between the valves and cylinder bore. The aim of all compressor builders should be to make this clearance space as small as possible in proportion to the volume swept through by the piston; for at the end of the stroke the clearance space is filled with air at the terminal pressure, which must expand back to the initial pressure before the inlet valve is opened. This is particularly important in single stage compression, as at discharge pressures ordinarily used the expanding of the compressed air in the clearance space back into the cylinder seriously affects the volumetric efficiency of the compressor.

Initial Heating.— The capacity and efficiency of a compressor is also affected by the initial heating of the air. Under ideal conditions the cylinder would, on the suction stroke, be filled with air at full atmospheric pressure and at a temperature no higher than that of the outside air, but such ideal conditions are impossible of attainment. Even with an unobstructed inlet passage air will not flow into the cylinder without some indifference in pressure to force it in, and when, as in many compressors, the inlet valves are of the spring weighted poppet type, this difference as to its effect upon capacity and efficiency becomes a serious matter. Then again, the entering air comes in contact with the cylinder walls, cylinder head, piston and clearance surfaces which have become highly heated during the preceding compression stroke, and is heated thereby to a temperature above that of the surrounding air. This not only reduces the volume of free air at the outside temperature which can be handled, but also raises the terminal temperature of compression.

It is essential to economy in air compression: (1) That the percentage of clearance be kept as small as possible. (2) That the inlet and outlet areas should be large in order to reduce friction losses and heating and to ensure the complete filling of the cylinder at all speeds. (3) That the entering air should pass through short ports, in a solid stream, and over as small an extent of heated surface as possible. (4) That the cylinders and cylinder heads should be water-jacketed in order to take away as much of the heat of compression as possible. To accomplish this as well as to facilitate cleaning, all water spaces and pipes should be large and an ample supply of cooling water used, as cold as can be obtained. Suitable hand holes or openings for cleaning out water spaces should be provided and made use of frequently, and the water should be as clear and free from sediment as possible. (5) That multi-stage compression should be used for anything beyond very moderate pressures.

Hydraulic Compression of Air.— The method of compressing air by means of falling water forms a most interesting topic in the subject of air compression. One of the old forms of compressing air is by means of a trompe or water bellows. Many improvements have been made on this early apparatus and distinct types developed from it, prominent among which are the Frizell, Baloche, Krahnass, Taylor and Arthur devices. There are several phenomena in connection with hydraulic air compression that at first sight seem paradoxical. In compressing air by hydraulic means, the air becomes drier during the compression, but whatever may be its initial condition as to humidity at the end of compression it will be saturated with moisture. Again isothermal compression is secured and, generally speaking, at uniform temperature a given *volume* of air implies a capacity for a certain weight of water whether the air is at a pressure of one or 100 atmospheres, but if the air is compressed through a range from one to 100 atmospheres, its volume will be reduced, if the compression is isothermal, to 1/100 part of the original volume, and in consequence 99/100 of the weight of moisture it originally held will be precipitated. In connection with this type of compressor it has been found that the compressor air contains less oxygen than the free air of the atmosphere and in consequence its use in mines is not as beneficial as air from other types of compressors. The losses inherent in hydraluic compression are: (1) The heat expended in impregnating the water with air; (2) a loss which may be called the slip due to the velocity with which the bubbles tend to rise; (3) a loss due to the increasing solution of the air in the water with the increasing pressure as the water and air descend.

Multi-Stage Compression.— It frequently happens that high pressures are demanded for commercial purposes, and in order to satisfy this demand, avoid the danger of explosion due to high temperatures and reduce the losses due to adiabatic compression, engineers have adopted a multi-stage system of compression — compressing the air partly in one cylinder, passing it through an intercooler where its temperature and volume are reduced, then compressing it still further in a second cylinder, and, if the pressures required are high, this compressed air is passed to a second intercooler, thence to a third cylinder and in some cases a third intercooler and a fourth cylinder, and required to secure the desired compression pressure economically. The advantages of this system of compression more than offset the extra expense in constructing the compressor. The larger the volume of the intercooler, the more time is required for the compressed air to cool; for this reason *receiver intercoolers,* as they are termed, are more efficient than those of small volumetric capacity. See AIR COMPRESSORS; AIR PUMP; CONDENSER; POWER TRANSMISSION.

Bibliography.— Hiscox, 'Compressed Air' (New York 1901); Peele, 'Compressed Air Plant' (ib. 1913); Unwin, 'Compressed Air' (ib. 1903); Simons, 'Compressed Air' (ib. 1914).

EDWARD S. FARROW,
Consulting Civil and Military Engineer.

COMPROMISE OF 1820, in American political history, a national law enacted by Congress 6 March 1820. In 1819 the Territory of Missouri, with a population of 60,000, demanded admission into the Union as a slave State. Arkansas was preparing to make similar demands. Such action would have given the South the balance of power in Congress, and the North made this a national issue. The North controlled the House of Representatives, while the South controlled the Senate. A deadlock was inevitable, and a party of compromise sprang up, which succeeded in producing a temporary arrangement acceptable to both parties. This was the compromise of 1820. It divided the Louisiana Purchase between freedom and slavery by a line drawn at 36° 30′ N. lat. See UNITED STATES — ABOLITION AND THE FREE SOIL MOVEMENT.

COMPROMISE OF 1833, Henry Clay's tariff compromise, to prevent civil war on account of nullification by South Carolina. The tariff of 1828 was regarded by the South as injurious and inequitable, raising its expenses and reducing its income, and laying burdens upon it without compensating advantages. The tariff was borne in the hope that Jackson, a Southern man, would throw his influence against it, but when he signed the amended act of 1832, leaving the duties much as they were, South Carolina took the lead in revolt. On 19 Nov. 1832, a convention called by its legislature declared the act of 1828 and its amendments null and void, forbade its enforcement in the State or appeal to the Supreme Court regarding it, and decreed secession in case the United States should attempt to use force. On 4 Dec. 1832, Jackson's annual message mildly criticised the tariff as overgrown and needing gradual retrenchment to a revenue basis, and apologized for the popular resistance, which he thought the laws adequate to suppress. The nullifiers and their opponents alike thought he had surrendered to the former as in the Cherokee case (see CHEROKEE NATION *v.* GEORGIA); but on the 10th, apparently from a sudden shift of emotional feeling, he issued a powerful proclamation against them, characterizing nullification as an absurdity "incompatible with the existence of the Union," and declaring that it would be resisted by the entire national force. There was great enthusiasm throughout the North, and general approval even in the South, but South Carolina returned a defiant counter-proclamation, and Calhoun resigned the Vice-Presidency, to be immediately returned to the Senate as the champion of nullification. To remove the grievance the House Committee of Ways and Means on the 27th reported the Verplanck Bill, reducing the tariff within two years to the standard of 1816, the primitive basis. But the President, angered by the new South Carolina threat, asked for a bill to enforce the law by military power, and extend Federal jurisdiction over revenue cases — called by the people the Force Bill, and by the South Carolinians the "Bloody Bill." All parties were perplexed and unable to act. South Carolina had relied on Southern support, which was not forthcoming; the House could not agree on the Verplanck Bill nor the Senate on the Force Bill. On 12 February, 20 days before the final adjournment of the 22d Congress, Clay undertook a compromise. He introduced a bill into the Senate which reduced the duties to a general 20 per cent by a sliding scale to end in 1842, enlarged the free list, etc. Clay's assigned motive was, that without some such measure the protective system was likely to be abolished altogether, but not before there had been civil war, in which the South would not let South Carolina stand alone. A further motive was, that he dreaded to see Jackson made a virtual dictator with a large army in his hands, as none could tell what he might do with it. Calhoun struck hands with Clay, though the pending Verplanck Bill was a far greater relief to the South. But Calhoun was far more anxious for a triumph of nullification and the consequent mastery by the South of her own destinies, than, for mere lightening of material burdens, and the compromise bill would be notoriously a concession wrung from the North by the threat of nullification while the Verplanck Bill, even if passed (which was dubious), would be only a bill like any other. The compromise bill was referred to a select committee with Clay for chairman. The manufacturers' lobby insisted on amendments, of which the chief was very obnoxious to the South — that for computing ad valorem duties on the basis of valuation at the home ports. As they made this an ultimatum, Clay supported it in the Senate, while Calhoun denounced it as both oppressive to the South and unconstitutional. Finally Clayton of Delaware, a strong Protectionist, threatened for his party to lay the whole on the table unless the Calhounists and their leader voted for the amendment, which they did. Meantime the Force Bill had passed the Senate; and Clay urged it to pass the compromise tariff bill also, so that the bill for violence should have that for harmony to counteract it. The objection was raised that the bill was one to raise revenue, and could not originate in the Senate. This was met by the shrewd device of moving the House to strike out all but the enacting clause of the Verplanck Bill and substitute Clay's bill, and send it to the Senate for concurrence, — which it did the next day, and the Senate adopted it. South Carolina, which had appointed 1 February for the nullification ordinance to go into effect, repealed it, and the country hailed it as a great deliverance. Clay himself later confessed, however, that he doubted whether he had done wisely. The nullifiers denied that they had abandoned a jot of their contention; hailed the result as a proof that it was the only means by which the South could obtain justice; and professed to have postponed the date of its operation only out of friendship to Virginia, which sent a commissioner to deprecate it. It is certain that the South won both the material and the moral fruits of the victory. Consult Schurz, 'Life of Henry Clay' (Vol. II, Chap. 14); also other lives of Clay and biographies of Jackson and Calhoun.

COMPROMISE OF 1850. The Missouri Compromise of 1820 (q.v.) had divided the Louisiana Purchase between free and slave territory at 36° 30′ (the general boundary between Arkansas and Missouri), except that Missouri was to be slave. The extreme pro-slavery members, about one-fifth of the House and one-fourth of the Senate, based their opposition on the ground that Congress had no power to legislate on slaveholding in the Territories, it being a fundamental right implied in the Constitution; but the majority admitted the jurisdiction by passing the bill. The joint resolution for admitting Texas in 1845 extended the same line to any new bodies formed out of that State; and was supported by the most ultra slavery men, as taking the merest sliver from them and securing solidly the enormous remainder. When the Mexican War seemed likely to add new territory, the Wilmot Proviso (q.v.) of 8 Aug. 1846, attempted to bar slaveholding from it, as did existing Mexican law; and the struggle to prevent this transformed political parties. After the annexation had taken place, 2 Feb. 1848, bills for organizing the Territories of New Mexico and California were introduced: at first in an omnibus bill with Oregon (the Clayton Compromise), to force all of them to permit slaveholding; then to extend the Missouri compromise line to the Pacific (including in slave territory nearly all the present New Mexico and Arizona and the entire southern half of California); then the Democratic Senate receded from the Oregon "hold-up," and the House repeatedly attempted to organize the other bodies as territories with the proviso; while the Senate regularly killed the bills, and once attempted to attach its own as rider to an appropriation bill. This went on till the end of 1849, when the gold discoveries in California forced the hand of both the Southern slavery party and its Northern allies. The immense immigrant population there formed a constitution prohibiting slavery and demanded admission of California as a State. Even the deniers of the right of Congress to legislate on slavery had always admitted that the people of a State had the right to live under any constitution they pleased; and the Democrats, to hold their vote in North and South, now took the position that the inhabitants of an inchoate State should be allowed to decide their own destinies. As this meant the immediate reinforcement and ultimate supremacy of the free States, the Southern Whigs and Democrats began to draw together and formulated the doctrine that the people of a Territory had no right to exclude the industrial or social system of any part of the Union; that Congress should force them to rescind such exclusion if made; and that the exclusion, if permitted, was a wrong which justified secession. But California was not a Territory: it was a body of unorganized settlers who would come in as a State from the first, and certainly could be admitted by Congress on their own terms. The Southern leaders, therefore, resolved that they should not be admitted except by passing through the territorial stage, so as to come under the congressional prohibition. Zachary Taylor, a slaveholder, but a moderate and just-minded man, had been inaugurated as President in March 1849, and his first Congress met in December. The Senate had a large Democratic majority; the House was so evenly divided that the few Free-Soilers held the balance, and it required 63 ballots and three weeks to elect a speaker, Howell Cobb, of Georgia. On their meeting Taylor had sent a message recommending California's wish to become a State, to their favorable consideration; on 21 Jan. 1850, he sent a special message, declaring that the people would not sustain them in denying the Californians the right of self-government. The South, nevertheless, was passionately determined not to yield; and Henry Clay undertook one of the great compromises which were the pride of his life, the shortest-lived and most destructive compromise in American history. The difficulty was to find anything that either side wanted badly enough to take as a price for yielding. For the South, this was found in the Fugitive Slave Law (q.v.), which Alexander H. Stephens declared to be the very essence and heart of the whole compromise and the breach of which by the Northern personal-liberty laws was accounted the crowning justification of secession; and in a money indemnity to Texas for abandoning her claim to the Rio Grande as a western boundary, which that State was ready to fight for, but the payment for which would raise the market value of her bonds, largely held in the South. For the North, it was found in the admission of California as a free State and the prohibition of the slave-trade in the District of Columbia — the latter a mere sop, as slavery was not abolished in the District. The sacrifices were, that the South gave up the right of insisting that no free State should be admitted into the Union except as paired with a slave State, and so in her own view gave the North the fruits of the Mexican War; the North gave up the proviso and the right of stopping the interstate slave trade, though this was later stricken out. On 16 January a bill had been brought into the Senate to organize "the Territories of California, Deseret [Utah], and New Mexico"; on the 29th Clay unfolded his compromise, in eight resolutions: (1) admitting California with her free-State Constitution; (2) organizing the remainder of the newly acquired lands as territories, without restriction as to slavery, as it "did not exist [there] by law, and was not likely to be introduced," — merely staving off the question till they formed State governments; (3, 4) annulling Texas' claim to New Mexico, but paying her a blank indemnity; (5, 6) non-abolition of slavery in the District of Columbia without the consent of Maryland, but prohibition of the slave trade in it; (7) a more effectual fugitive slave law; (8) non-interference with the interstate slave trade. Clay said that the question with the South was one of interests, with the North one of sentiment, and the latter was easier to sacrifice than the former. The Northern members and their constituents did not agree to this, nor did the South as to the equivalents; and after two months' debate the question was referred to a compromise committee of 13, of which Clay was chairman. On 8 May it reported a bill of four parts, known in history as the Omnibus Bill (*par excellence,* for there have been others), to be passed or rejected as a whole. The essential changes were, that New Mexico and Utah were forbidden to pass laws respecting slavery, that California should not be admitted unless this were granted, that the blank for the Texas indemnity should be filled with $10,000,000 and that no mention was made of the interstate slave trade. It will be observed that the gains in this revised "compromise" were pretty much all by the South. The bill of course embodied the specific legislation needed to make the resolutions effective. Part 1 consisted of the provisions for admitting California, New Mexico and Utah, and indemnifying Texas; parts 2 and 3 were the Fugitive Slave Law of history; part 4 the provisions about the District of Columbia. This bill was stormily debated for nearly three months more, until 31 July, and amended until one item only was left, that admitting Utah, which passed the next day. Meantime Texas was arming and threatening war, and other States proposing to aid it; and Congress saw that the bills must be passed in some shape. The items were therefore voted on as separate bills, and all passed in Clay's form: Texas bill — Senate, 10 August, 30 to 20; House, 4 September, 108 to 97. California — Senate, 13 August, 34 to 18; House, 7 September, 150 to 56. New Mexico — Senate, 14 August, 27 to 10; House (together with the Texas bill), 4 September, 108 to 97. Fugitive Slave Bill — Senate, 23 August, 27 to 12; House, 12 September, 109 to 75; District of Columbia — Senate, 14 September, 33 to 19; House, 17 September, 124 to 47. The Fugitive Slave Law, the vital part of the compromise, was also its assured ruin, as it gradually turned the entire North into abolitionists; but the immediate cause of its collapse was the Kansas-Nebraska Bill (q.v.), which repealed not only the Missouri Compromise, but the present compromise which practically reaffirmed that. Consult Von Holst, 'Constitutional History of the United States' (Vol. III); Benton, 'Debates of Congress'; Stephens, 'War between the States' (Vol. II); and lives of Clay.

COMPROMISES OF THE CONSTITUTION. See CONSTITUTION, FORMATION OF THE.

COMPSOGNATHUS, kŏmp-sŏg-nā'thŭs, a genus of extinct reptiles of carnivorous dinosaurs (see DINOSAURIA) of the Jurassic Period, of very small size, hardly larger than a domestic cat, and slenderly proportioned. A very perfectly preserved skeleton has been found in the lithographic limestone of Solenhofen in Bavaria. It is remarkable as being the most bird-like reptile known. It had a light, bird-like head, very long neck and hind limbs, small fore-limbs and many teeth. It is supposed to have walked or hopped in an erect or semi-erect position just as a bird does. In this position it must have resembled a bird very much.

COMPTOMETER, compt-ŏm'ĕ-ter (from Fr. *compter,* to count + Gr. *meter,* a measure), an adding and calculating machine, on which can be performed rapidly and accurately all arithmetical problems involving addition, multiplication, division and subtraction. The name was coined by Dorr E. Felt, inventor of the machine, in 1885. The comptometer is now widely used on all forms of figure work in all lines of business in the United States and throughout the world. It differs from all the earlier constructive efforts directed to the production of mechanical calculating devices in that it was the first successful multiple-order machine to be wholly operated by the rapid depression of keys, an advantageous feature as a time-saving factor. Illustrative of the fundamental principle of direct key operation and its simplicity in practice are the following brief descriptions of how the results are obtained.

Comptometer

Addition is performed by merely depressing the keys according to the numbers to be added. The item 346, for example, is added by striking the 3-key in the third or hundredths column, the 4-key in the second or tens column and the 6-key in the first or unit column, and the answer appears in the register. Subsequent items are added in the same manner, the accumulated total being shown in the register. To multiply, the fingers are placed on the keys representing one factor, which are struck according to the digits of the other factor. For examle, to multiply 578 by 463, place the fingers on 578 and strike three times; move one column to the left and strike six times; once more to the left and strike four times and the register shows 267,614. Each key also bears on its top a small figure which indicates the power of that key for subtracting and dividing. These operations are the converse of adding and multiplying and are likewise performed by simply depressing the keys, but with reference to the small figures on the keytops. The only function of the lever at the side of the machine is to zeroize or cancel the answer registered preparatory to the beginning of a new operation. In its commercial application, the use of the comptometer extends in a practical way to all arithmetical calculations of accounting, including additions; extending and footing of invoices, inventory, payrolls, estimates; making engineering, astronomical and scientific calculations; in all of which, fractions decimally expressed, are as easily handled as whole numbers. Provision for the addition of common fractions is made by inclusion in the keyboard of a special fractional column or columns. By this means fractional values are automatically accumulated and carried forward in progressive order from the lower to the next higher denomination. To meet special requirements, such as the adding of fractional denominations of foreign currency of various kinds, the different unit divisions of weights and measures, and special uses in the various departments of commercial accounting, suitable combinations of fractional columns are employed. Thus the pounds, shillings, pence and farthings comptometer, widely used in England and other parts of the British Dominion for adding British currency, is provided with fractional columns of 20ths, 12ths and 4ths. In a similar manner a model with fractional columns to 12ths and 16ths serves for adding British-Indian currency, consisting of rupees, annas and pies. 12 pies = 1 anna, and 16 annas = 1 rupee. Another model supplied with fractional columns to 40ths is used for adding funts and poods, the Russian measure of weight, in which 40 funts=1 pood. A combination designed for the use of contractors, engineers and architects has columns for 12ths and 16ths which facilitate the adding of feet, inches and fractions of inches. Fractions in 60ths are provided for adding hours and minutes; and double 60ths for adding hours, degrees, minutes and seconds in the compilation of astronomical and geographical data. The formation of many other combinations is possible on the comptometer.

Mechanical arithmetic, as practised on the comptometer, being universal in its scope, constitutes in itself a complete system of mathematics. It is, of course, based on fundamental laws of mathematics, many of which are employed in arithmetical operations by the mental method but utilizing others not ordinarily so used. It is none the less a distinctive and original system in that it involves as many and as varied rules as are involved in the performance of arithmetical operations by the instrumentality of paper and pencil. The full significance of the difference between the processes employed in mechanical and mental arithmetic could be clearly shown only by the aid of illustrative examples too lengthy for insertion in this article. The system of applied mechanical arithmetic, with the rules for its application to all forms of arithmetical calculations, was first originated and developed by Mr. Felt. Consult Felt, D. E., 'Applied Mechanical Arithmetic' (Chicago 1895).

COMPTON, Edward, English actor: b. London 1854. He made his début at the new Theatre Royal, Bristol, in 1873 and in London at Drury Lane in 1877. In 1879–80 he accompanied Adelaide Neilson on her American tour. He organized the Compton Comedy Company in 1881 and with this built up a repertoire of over 50 plays in about 30 years. He was associate manager of the Kennington Theatre in 1911 and toured as Nobody in 'Everywoman' in 1912–13.

COMPTON, Henry, English bishop: b. Compton Wynyates, Warwickshire, 1632; d. Fulham, 7 July 1713. He was the youngest son of Spencer, 2d Earl of Northampton, studied at Oxford, and after the Restoration became a cornet in a regiment of horse. After he left the army for the Church, became bishop of Oxford in 1674, and bishop of London in 1675. Charles II made him a member of his privy council, and entrusted to him the education of his nieces Mary and Anne. He was distinguished for his hostility to the Roman Catholic Church. After the accession of James II, Dr. Sharp, rector of Saint-Giles-in-the-Fields, having become highly obnoxious to the court, Compton was required by a royal order to suspend him. His refusal to obey was made the ground of his own suspension. He was restored to his see at the Revolution of 1688, and, together with the bishop of Bristol, made up the majority of two in the House of Lords for filling the vacant throne. He performed the ceremony of the coronation of William and Mary, and was afterward appointed one of the commissioners for revising the liturgy. During the reign of Anne he was put on the commission for the union of England and Scotland. The reconciliation of dissenters with the Church of England was one of his favorite projects.

COMPTROLLER, State. An officer — sometimes an "auditor" — directly responsible to the legislature, who sees that all legal requirements for the payment of State funds are complied with, that claims are valid, that the payment of same have been authorized and that the funds have been appropriated and are available, whereupon bills are paid on his warrant. He supervises the State finances to the extent also of compelling clearness, accuracy and completeness in the accounts, the indication of all receipts and the legality of all disbursements. In some States the comptroller has been partly supplanted by the board of control. Consult Ashley, R. L., 'The American Federal State' (New York 1908); Bryce, James, 'The American Commonwealth' (rev. ed., New York 1914); Wilson, Woodrow, 'The State' (rev. ed., Boston 1909).

COMPTROLLER OF THE CURRENCY, the name of the head of the currency bureau of the United States Treasury Department. He has special jurisdiction over the national banks of the country, supervising and examining them and recommending legislation for their regulation, besides approving all applications for the establishment of new banks. He has charge of all the national bank examiners, and five times each year, upon call, the national banks must render to him, according to furnished forms, a report of their condition. He may place a bank in receivership if satisfied that it is insolvent, but must exercise a large amount of discretion and sound business judgment since, particularly in times of panic and commercial depression, it may be unwise to compel a bank literally to comply with the terms of the law. Under the act of 23 Dec. 1913 the comptroller is a member of the Federal Reserve Board and has supervision over the reserve banking system created by that act. The comptroller of the currency also issues circulating notes to the national banks and exchanges old currency for new. Consult Fairlie, J. A., 'National Administration of the United States' (New York 1905).

COMPTROLLER OF THE TREASURY. The act of 1789 establishing the Treasury Department provided for an auditor, who should see that accounts against the government are in proper form, and a comptroller, who should see that such accounts conform to the law and that payments of same have been authorized by statute. By the Dockery law of 31 July 1894 the duties of the comptroller, which are largely judicial, are more clearly defined, all appeals from the auditor's findings being referred to him, while he is the one also who advises the disbursing officers regarding the validity of payments, if any doubt should exist as to the interpretation of an appropriation bill or other statute under which such payments are to be made. Though nominally a subordinate officer in the department, the comptroller has authority over all expenditures, subject only to review by the judicial courts; he can revise all accounts; he supervises the assistant comptroller, who has authority to countersign all warrants; his decisions are binding on the Secretary of the Treasury; and in his province on questions of law he is independent of the Attorney-General. In 1895 one comptroller even claimed the right to determine the constitutionality of the sugar bounty of the McKinley tariff of 1890, refusing to endorse warrants to pay such bounties to domestic producers of sugar. Consult Hotchkiss, W. E., 'The Judicial Work of the Comptroller of the Treasury' (Ithaca, N. Y., 1911).

COMPULSORY ARBITRATION. See Arbitration, Industrial.

COMPULSORY EDUCATION. See Education, Compulsory.

COMPULSORY HEALTH INSURANCE. See Social Insurance.

COMPULSORY VOTING. See Vote; Voters; Voting.

COMPURGATION, a mode of defense allowed by the Anglo-Saxon law in England, and common to most of the Teutonic tribes. The accused was permitted to call a certain number (usually 12) of men, called compurgators, who joined their oaths to his in testimony to his innocence. They were persons taken from the neighborhood, or otherwise known to the accused, and acted rather in the character of jurymen than that of witnesses, for they swore to their belief, not to what they knew; that is, on the accused making oath of his innocence, they swore that they believed he was speaking the truth. Compurgation in the ecclesiastical courts was not abolished till the reign of Elizabeth and it was used in some civil cases as late as 1833. The Assize of Clarendon, 1166, is credited with helping strongly to the doing away with compurgation in the King's Courts as a mode of trial for crime. Consult Blackstone, 'Commentaries on the Laws of England'; Pollock and Maitland, 'History of English Law.'

COMPUTING SCALES. As is well known, the weight of a commodity is ascertained in order to form a basis for ascertaining its value at a given price per pound if in the United States or Great Britain and her colonies, or at a given price per kilogram in nearly all other civilized countries.

The computing scale is an instrument by which the value is obtained, mechanically, at a given price per pound or kilo, thus avoiding any error of making the calculations mentally, and causing the operation of weighing and ascertaining the value to be more speedily accomplished.

The computing scale business, as a successful commercial enterprise for the world, was inaugurated in 1891. Several earlier attempts were made, but without success. The business has rapidly increased since the above date, and hundreds of thousands of these machines are now in use throughout the world. Until recent years the United States was by far the largest market, but they have been introduced into Europe, South Africa, Australia and both the east and west coasts of South America, besides Canada, Mexico and West India Islands, until export trade in computing scales aggregates several hundred thousand dollars per year.

Construction of Computing Scales.— Broadly speaking, there are two types of computing scales: first, the variable leverage type, and second, the computed-chart type. The first type consists of a mechanism wherein the leverage of the computing beam may be varied so as to conform to the several units per pound or price per pound.

The computed-chart scale is further divided into two distinct kinds: first, the beam scale with computed chart, and second, the automatic scale with the computed chart. The former, or beam scale with computed chart, is a manually operated scale, operated as in ordinary scales by the movement of a sliding counterpoise, this sliding poise passing over the computed chart, and when the load is balanced by the movement of the poise, pointers on the poise indicate the total value of the commodity being weighed at the several prices per pound provided for on the computed chart.

The second, or automatic computing chart scales, are so constructed that when a commodity is placed upon the scale pan the load is automatically counterbalanced by the use of either counterbalancing springs or a pendulum counterbalancing weight, moving either the computed chart past a stationary indicator or moving an indicator past or over the stationary computed chart, the indicator in either instance having placed thereon the several prices per pound, and each price per pound placed adjacent to a pointer or other means of indication showing the total value of the commodity being weighed at the several prices per pound provided for in the construction of the scale.

The automatic chart scale is further divided into two distinct types of scales with respect to the construction or arrangement of the chart: One type being constructed upon the principle of arbitrarily dividing the pound into as many parts as there are cents in the price per pound as a means of computing weight. For instance, at 11 cents per pound the pound is divided into 11 parts, each part representing one-eleventh of a pound. The other type is constructed on the principle of dividing the pound into ounces and fractions of ounces on the binary system as a means of computing values. In other words the pound is divided into uniform fractions of the pound as in ordinary pound and ounce scales, and the true commercial value of each subdivision of the pound is indicated on the chart at the several prices per pound provided therefor. See BALANCE; WEIGHING MACHINES.

COMSTOCK, Anna (BOTSFORD), American natural history scientist, artist and engraver: b. Otto, N. Y., 1 Sept. 1854. After graduation from Chamberlain Institute, Randolph, N. Y., in 1873, and from Cornell University in 1878, she studied art at the Cooper Union, New York city, and under John P. Davis. In 1899 she was appointed assistant professor of nature study in Cornell University extension work, and 1899–1900 was lecturer in Leland Stanford Junior University extension work and assistant professor of nature study in Cornell 1913. She was awarded the bronze medal for wood engraving at the Pan-American Exposition of 1901. She is the author of ‹Problems of the Six-Footed›; ‹How to Keep Bees› (1904); ‹Confessions to a Heathen Idol› (1906); ‹Handbook of Nature Study› (1911); ‹The Pet Book› (1914); ‹Bird, Tree, and Plant Note-books› (1914).

COMSTOCK, Anthony, American reformer: b. New Canaan, Conn., 7 March 1844; d. New York, 21 Sept. 1915. In 1863 he enlisted in the 17th Connecticut regiment, served under General Gilmore and was mustered out in July 1865. In March 1873 he became secretary and special agent of the New York Society for the Suppression of Vice and completely identified himself with its work. It is said that largely through his special efforts 2,500 criminals were brought to justice and over 80 tons of indecent literature and pictures seized and destroyed. He wrote ‹Frauds Exposed; How the People are Deceived . . . and Youth Corrupted› (1880), an exposure of various schemes operated through the mails; ‹Traps for the Young› (1883); ‹Gambling Outrages; or, Improving the Breed of Horses at the Expense of the Public Morals› (1887); ‹Morals Versus Art› (1887); and minor tracts for the furtherance of his work.

COMSTOCK, George Cary, American astronomer: b. Madison, Wis., 12 Feb. 1855. He was graduated at the University of Michigan 1877 and from the law department of the University of Wisconsin 1883, devoted himself entirely to astronomy and since 1887 has been professor of that subject and director of the Washburn Observatory, and since 1906 dean of the Graduate School in the University of Wisconsin. He is a member of the National Academy of Sciences. He has written ‹Text-Book of Astronomy› (1901); ‹Field Astronomy for Engineers› (1902); ‹Method of Least Squares› (1890); and numerous papers upon astronomical subjects.

COMSTOCK, Harriet Theresa (SMITH), American author: b. Nichols, N. Y., 1860. She was educated in public schools and in the academy at Plainfield, N. J. She married Mr. Philip Comstock in 1885. Since 1895 she has become known as a prolific writer of juvenile stories and is author of ‹Molly, the Drummer Boy› (1900); ‹Cedric the Saxon› (1901); ‹A Boy of a Thousand Years Ago› (1902); ‹A Little Dusky Hero› (1902); ‹Tower or Throne› (1902); ‹When the British Came› (1907); ‹The Queen's Hostage› (1907); ‹Janet of the Dunes› (1912); ‹Joyce of the North Woods› (1913); ‹Camp Brave Pine› (1913); ‹A Son of the Hills› (1913); ‹The Place Beyond the Winds› (1915); and ‹The Vindication› (1916).

COMSTOCK, John Henry, American entomologist: b. Janesville, Wis., 24 Feb. 1849. He was graduated at Cornell University 1874; was United States entomologist at Washington, D. C., 1879–81, professor of entomology and general invertebrate zoölogy at Cornell 1881–1914, and since that date professor emeritus. His investigations deal with the morphology, classification and economic relations of insects. In this work he has been assisted by his wife, Anna Botsford Comstock (q.v.). He has been a constant contributor to the literature of his subject, the following being the more important of his works in book form: ‹Report on Cotton Insects› (1879); ‹Introduction to Entomology› (1888); ‹Manual for the Study of Insects›; ‹Insect Life› (new ed., 1901); ‹Elements of Insect Anatomy› (3d ed., 1903, with Kellogg); ‹How to Know the Butterflies› (with his wife, 1904); ‹The Spider Book› (1912); ‹The Wings of Insects› (1897).

COMSTOCK, John Lee, American writer on physics: b. Lyme, Conn., 1789; d. Hartford, Conn., 21 Nov. 1858. He received a common-school education, studied medicine and during the War of 1812 was assistant surgeon at Fort Trumbull, Conn., and on the Northern frontier. He settled in Hartford, Conn., practised medicine until 1830, when he became an author by profession and attained remarkable success in the compilation of textbooks for educational purposes. His ‹Introduction to Mineralogy› (1832) was used at West Point; of the ‹Elements of Chemistry› over 250,000 copies were sold; while the ‹System of Natural Philosophy› (1831) had a sale of over 900,000 copies (94th ed., New York 1847) and was translated into the chief European languages. Others were ‹History of the Greek Revolution› (1828); ‹History of the Precious Metals› (1849); ‹Natural History of Quadrupeds› (1829); ‹Grammar of Chemistry› (1825); ‹Introduction to Botany› (3d ed., 1835).

COMSTOCK, Theodore Bryant, American geologist: b. Cuyahoga Falls, Ohio, 27 July 1849; d. 26 July 1915. He was graduated at Pennsylvania State College 1868, and at Cornell 1870, where he was professor of economic geology 1875–79. In 1873 he was geologist to Capt. W. A. Jones' Wyoming and Yellowstone Park expedition and accompanied Hartt's expedition to Brazil 1870. He was professor of mining engineering and physics in the University of Illinois 1885–89, and assistant State geologist of Arkansas 1887–88, and of Texas 1889–91. He founded the Arizona School of Mines, was its director 1891–95, and president of the University of Arizona 1893–95. He was at various times engaged as manager, engineer and consulting expert to many mining companies and syndicates, both American and foreign. He published ‹Outline of General Geology› (1878); ‹Classification of Rocks› (1877);

'Notes on the Geology of the San Juan Country' (1882); 'The Geology and Vein Structure of Southwestern Colorado' (1886); the last two in the 'Transactions' of the American Institute of Mining Engineers; and numerous papers in the *American Journal of Science, American Naturalist* and *Engineering and Mining Journal.*

COMSTOCK LODE, a remarkable vein near Virginia City, Nev., carrying silver sulphides with some native silver and considerable native gold. The wide vein is a faulted fissure following the contact of a basaltic dike with the andesite country rock, the latter of Tertiary Age. The gangue is mainly quartz. The ores are of recent origin, and the waters ascending along the fissure are hot, making mining costly. Some wonderfully rich ore bodies, "bonanzas," were found in certain of the mines along the lode, and the history of its discovery, the great mining speculations based on it, and the final abandonment of nearly all the mines, reads like a romance. At present the deepest shaft on the lode is being reopened. The total yield of the lode from its discovery in 1859 up to 1890 was over $340,000,000; the greatest yield for a single year was $38,000,000 in 1877. The yield has declined since 1890. The Comstock Lode had been of great interest to scientists. In 1868 Von Richthofen studied here the geologic relations of the ore bodies and Van Hise, Becker and others evolved the modern classification of igneous rocks through their studies of the formations here. Barus conducted experiments here to determine temperature variations at different depths. Consult Becker, "Geology of the Comstock Lode and Washoe District," (in 'Monograph of the United States Geological Survey,' Vol. III, Washington 1882); Lord, "Comstock Mining and Miners," (in 'Monograph of the United States Geological Survey,' Vol. IV, ib. 1883); Reid, 'Structure and Genesis of the Comstock Lode' (Berkeley, Cal., 1905).

COMTE, kōnt, **Isidore Auguste Marie François Xavier**, generally known as AUGUSTE COMTE, a famous French philosopher: b. Montpellier, 19 Jan. 1798, of a strict Catholic family; d. Paris, 5 Sept. 1857. He was very precocious in his intellectual development; in his own words, at the age of 14 he went through all the necessary stages of the revolutionary tendency, and felt the necessity of a general political and religious rebirth. In 1814 he entered the École Polytechnique at Paris. Though the school was broken up by the government in 1816 for political reasons, Comte remained in Paris and developed a close acquaintance with Saint Simon (q.v.), from whom he learned the need of substituting a new spiritual power for the mediæval hierarchy in Church and State. However, a breach developed between these two men, dating from the publication of Comte's "Plan des travaux scientifiques necessaires pour réorganizer la société," which found the greatest hindrance to the development of society in the continued ascendancy of the revolutionary tendency. In 1825 he married Caroline Massin, but the marriage was unfortunate from the start. The following year he began to lecture on philosophy at his own house, but after his first few lectures he was struck down by an attack of insanity, which resulted in an attempt at suicide. This proved to be temporary, however, and in 1828 he was again able to carry on his intellectual labors and his lectures. In 1832 he became tutor in mathematics at the École Polytechnique, and in 1837 examiner at the same institution. He also engaged in secondary-school teaching. He held the post of examiner for some 10 years, but incurred the displeasure of his colleagues by some reflections on mathematics and lost the position. His British disciples, including among others Grote and J. S. Mill (q.v.) then supported him, sending him $1,200 in 1845. For the rest of his life he lived on the proceeds of a public subscription initiated by Littré in 1848. He was separated from his wife since 1842, and in 1845 he met Clotilde de Vaux, whose husband was serving a life sentence. He became excessively fond of her, and after her death the following year had another, though a less serious, attack of mental aberration.

Besides the book already named Comte wrote 'Cours de philosophie positive'; 'Discours sur l'esprit positif'; 'Calendrier positiviste'; 'Système de politique positive'; 'Bibliothèque positiviste'; 'Catéchisme positiviste'; 'Appel aux conservateurs, par le foundateur du positivisme'; 'Synthèse subjective'; 'Système de logique positive.' Comte believed that knowledge passed through three stages of development, the *theological* stage, in which the imagination plays the greatest part in giving accounts of things. The *metaphysical* stage, in which abstract principles replace the imaginary deities of the theology, and in which the tendency to unification takes the lead; and the *positive* stage, where both imagination and argumentation are subordinated to observation, and agreement with the facts becomes the ultimate scientific criterion. The facts arrange themselves in certain irreducible groupings, which are at least as many as there are distinct sciences, so that the unity of knowledge is subjective, not objective. These sciences Comte classifies according to the order in which they have reached their positive stage, as follows: mathematics, astronomy, physics, chemistry, biology, sociology. This order is also the decreasing order of broadness of scope in the sciences concerned and the order of the importance therein of induction as compared with deduction. Comte devotes special attention to sociology and ethics; he finds the division of the forms of civilization into militaristic, juristic and industrial quite parallel to the threefold division of science. He desires to unite the treatment of the emotional and intellectual needs of man. For this purpose a new religion becomes necessary, the "Religion of Humanity," and a new political Utopia. See POSITIVISM.

Bibliography.— Caird, 'The Social Philosophy and Religion of Comte' (Glasgow 1885); Fezensoc, L. De, 'Le système politique d'Auguste Comte' (1907); Fiske, 'Outlines of Cosmic Philosophy' (Vol. 1, Boston 1874); Gruber, 'August Comte, sein Leben und seine Lehre' (Freiburg 1889); Levy-Bruhl, 'La philosophie d'Auguste Comte' (1900; tr. 1903); Lewes, G. H., 'Comte's Philosophy of the Sciences' (London 1875); Littre, 'Auguste Comte et la Philosophie positive' (Paris 1877); Mill, J. S., 'Comte and Positivism' (London 1865); Robinet, 'Notice sur l'œuvre et sur la vie de Comte' (1860); Spencer, H., 'The

Classification of the Sciences' (New York 1864).

COMTE, Pierre Charles, French painter: b. Lyons, 23 April 1823; d. 1895. He studied at Paris as a pupil and adopted son of Robert Fleury, and exhibited his picture 'Lady Jane Grey,' in 1847, which won him considerable attention. His other works include 'Crowning of Ines de Castro' (1849); 'Henry III Meeting the Duke of Guise' (1855); 'Joan of Arc at the Coronation of Charles VII' (1861); 'A Scene at Fontainebleau' (at Washington, D. C.); 'Gipsies Before Louis XI'; 'The Last Visit of Charles V to the Castle of Ghent,' 'Winter' (1876); 'Don Quixote' (1877); 'Dante' (1878); 'Francis I at Fountainebleau' (1880).

COMTE DE PARIS, dė pä-rē. See PARIS, LOUIS PHILIPPE ALBERT D'ORLEANS, COMTE DE.

COMUS, kō'mŭs (Greek *kōmos*), in ancient Greece the name given to a kind of festal procession in honor of some of the gods (as Bacchus) and sometimes in honor of victors in the public games. The term had also the wider sense of revel and merry-making. This name was also given to a divinity supposed to preside over such festive occasions, but as his name does not occur in early ancient writers whose works have been preserved, he is evidently a creation of later times. He is first mentioned by Philostratus (about 200 A.D.).

COMUS. This is the title given to a masque by John Milton, produced in honor of the Earl of Bridgewater, upon his entrance on his duties as Lord President of Wales, at Ludlow Castle, on Michaelmas night, 29 Sept. 1634. The young Puritan poet was induced to furnish the words for the entertainment — such things were not in favor with most of his coreligionists — by a family friend, Henry Lawes the musician, who gave instruction to the Earl of Bridgewater's children. Three of these acted in the masque, and Lawes himself took the part of the Attendant Spirit besides furnishing the music. Apparently Milton about a year before had rendered Lawes a similar service by writing for him the less elaborate 'Arcades.' We know little about the production of 'Comus' or about its composition, save that it was written during what is called Milton's "Horton period," but it was evidently talked of admiringly, since in 1637 Lawes, to furnish friends with copies, printed an edition without the author's name, to which was prefixed a very complimentary letter by Sir Henry Wotton. In this edition, as well as in Milton's editions of his shorter poems in 1645 and 1673, the designation is not "Comus," but "A Mask." A manuscript copy in Milton's handwriting and another supposed to be in that of Lawes are extant. 'Comus' has naturally been subjected to much scholarly investigation, and numerous "sources" have been suggested — chiefly, the Circe myth as treated in the Odyssey and by poets drawing on that, notably Spenser; George Peele's play 'The Old Wives' Tale,' which gave Milton the kernel of his simple plot; Fletcher's 'The Faithful Shepherdess'; a play in Latin entitled 'Comus' by the Louvain professor Erycius Puteanus (Hendrik van der Putten); and Ben Jonson's masque 'Pleasure Reconciled to Virtue.' That Milton drew to some extent upon these and other works seems indisputable, but the fact does not impair his essential originality, which is seen, not merely in the unsurpassed charm, purity and philosophical elevation of his poem taken as a whole, but in his developing the shadowy Comus of mythology into a well-defined and not unimpressive character.

Criticism of 'Comus' has been in the main highly laudatory, not a few persons preferring it and the other poems of the "Horton period," 'L'Allegro' and 'Il Penseroso' and 'Lycidas,' to the works of Milton's later years, including even 'Paradise Lost.' On such a point argument seems useless. One who demands the sonorous sublimity of the great epic, the poised dignity of 'Paradise Regained,' the severe strength of 'Samson Agonistes,' will not find these qualities present in large measure in 'Comus.' On the other hand, one who delights in the fascinating style of 'Comus,' in the noble idealism of its portrayal of the power of virtue, in the pure lyrical and pictorial qualities of the closing portion beginning with the invocation to "Sabrina fair," is not likely precisely to renew his delights in the later poems. It is more catholic and profitable to enjoy the great poet both in this product of the graceful strength of his early genius and in the more powerful achievements of his riper years. We shall do this the more certainly if we avoid a tendency observable in some critics to deal with 'Comus' as though it were a regular drama. In its use of blank verse, its comparatively long speeches, its diminished insistence upon the more spectacular elements of the typical masque, 'Comus' does approximate a play, and thus Milton may be said to give some handle to those critics who demand from him a more realistic and convincing handling of his characters. One can, therefore, understand how some people regard the great speeches as fine poetry put into the mouths of uninteresting puppets, and how one biographer actually has the heart to call the elder brother a prig. But after all 'Comus' is not a play but a masque developed into a philosophical poem, and in this more or less unique capacity it should be judged. One may doubt whether the ideals of personal purity have ever been more inspiringly set forth than in this poem, in which exquisiteness and nobility seem to be perfectly blended. From such a point of view one does not need to realize the plight of the lost lady exposed to the wiles of the enchanter, or to enter into the feelings and watch the actions of the two brothers who seek to rescue her, with the intensity of conviction and sympathy that would be required if 'Comus' made the same demands as a regular drama. What one has to do is rather to give one's self up to the beauty of the style and the nobility of the thought, more or less leaving the action and the characterization to take care of themselves.

WILLIAM P. TRENT,
Professor of English Literature, Columbia University.

COMYN, kŭm'ĭn, **John,** THE ELDER, Scottish noble: d. about 1300. He was one of the commissioners sent to confer about the marriage of the Maid of Norway to Prince Edward of England. On the competition for the Scottish throne in 1291 Comyn put in a claim as a descendant of Donald Bane.

COMYN, John, Scottish noble: d. Dumfries 1306. He was called the «Red Comyn,» was chosen one of the three guardians of Scotland and defeated the English at Roslin in 1302. He submitted to Edward I in 1304 and was killed by Bruce in the Convent of the Minorites at Dumfries in 1306, a well-known episode in the life of the great Scottish king. A sort of vendetta followed and many of the Comyns of succeeding generations perished in attempts to avenge the death of the Red Comyn.

CON, kŏn, an Italian preposition signifying with, and of frequent occurrence in musical phraseology; *con amore,* with feeling; *con brio,* brilliantly; *con gusto,* with taste, etc.

CONANICUT, an island of Rhode Island, situated in the lower part of Narragansett Bay. It is about nine miles long and one mile wide. The town of Jamestown is near the east shore and there is a lighthouse at the north end. Pop. of township about 1,200.

CONANT, Alban Jasper, American artist: b. Chelsea, Vt., 24 Sept. 1821; d. New York, 3 Feb. 1915. He settled in Saint Louis in 1857, and during the Civil War visited Washington and painted portraits of President Lincoln, Secretary Stanton and Attorney-General Bates. He was a curator in the University of Missouri for eight years and made valuable studies of the archæology and antiquities of the Mississippi Valley. In 1880 he was appointed Délégué Correspondant de l'Institution Ethnographique of Paris. He published ‘Footprints of Vanished Races in the Mississippi Valley’ (1879, 4to 1); ‘The Archæology of the Missouri Valley’; ‘My Acquaintance with Abraham Lincoln,’ etc.

CONANT, Charles Arthur, American economic writer: b. Winchester, Mass., 2 July 1861; d. New York, 5 July 1915. He was for some years after 1880 a journalist in Boston, from 1889–1901 was Washington correspondent of the New York *Journal of Commerce* and in 1903 became treasurer of the Morton Trust Company. He did important work for the gold standard and the gold-exchange standard and aided in the development of a monetary system in the Philippines. He was a member of the New York Chamber of Commerce committee on currency reform (1906), which recommended a central bank; and in 1910 he was American delegate to The Hague Conference on Bills of Exchange. He wrote many articles for periodicals and encyclopædias on American banking and on Latin-American finance and trade, and published ‘A History of Modern Banks of Issue’ (1896); ‘The United States in the Orient: the Nature of the Economic Problem’ (1900); ‘Alexander Hamilton’; ‘Securities as Payment’; ‘Wall Street and the Country’ (1904); ‘The Principles of Money and Banking’ (1905).

CONANT, Hannah O'Brien Chaplin, American author: b. Danvers, Mass., 1809; d. Brooklyn, N. Y., 18 Feb. 1865. In 1830 she married Thomas Jefferson Conant (q.v.). She was a woman of versatile talent, having an excellent knowledge of Oriental tongues, which enabled her to share in the biblical studies of her husband. She frequently contributed to the literary and religious periodicals of the day, and in 1838 became editor of the *Mothers' Monthly Journal* at Utica, N. Y. She published ‘Lea: or the Baptism in the Jordan,’ by G. F. A. Strauss (1844); ‘First Epistle of John Practically Explained,’ by A. Neander (1852); ‘The New England Theocracy,’ by H. F. Uhden (1859), all translations from the German; ‘The Earnest Man: Sketch of the Character and Labors of Dr. A. Judson’ (1855); ‘The English Bible: Popular History of the Translation of the Holy Scriptures into the English Tongue’ (1856; English ed., 1859; new ed., 1881).

CONANT, Thomas, Canadian descriptive writer: b. Oshawa, Ontario, 15 April 1842; d. there, 14 March 1905. He was educated in the public schools and at Eddystone Seminary in Geneva, N. Y., and achieved distinction with brilliant sketches of scenery and articles on Canadian and other subjects.

CONANT, Thomas Jefferson, American biblical scholar: b. Brandon, Vt., 13 Dec. 1802; d. Brooklyn, N. Y., 30 April 1891. He was graduated from Middlebury College in 1823, and between 1825 and 1857 taught the classics and biblical literature in Columbia College, Waterville (now Colby) College, Maine, Madison, now Colgate, University, Hamilton, N. Y., and Rochester Theological Seminary. Taking up the studies that soon gave him a wide reputation, he was appointed by the American Bible Union one of a committee to prepare a revision of the English version of the New Testament. He was also a member of the American committee on the English revision of the Old Testament, and his revisions were highly esteemed and constantly used by the English revisers. His numerous publications include translations of the 11th and 17th editions of Gesenius' ‘Hebrew Grammar’; ‘Job; Revised Version, and Notes’ (1856); ‘Matthew, Revised Version’ (1860); ‘Baptizein, Its Meaning and Use’ (1860); ‘Genesis, Revised Version’ (1868; 1873); ‘The New Testament; Common Version Revised’ (1871); ‘Psalms, Revised’ (1871); ‘Proverbs, Revised’ (1872); ‘Greek Text of the Apocalypse, as edited by Erasmus’ (1873); ‘Prophecies of Isaiah, Chapters 1–12’ (1874); and ‘Historical Books of the Old Testament, Joshua to 2 Kings’ (1884).

CONATION (from Lat. *conari,* to attempt), a term in its original sense used simply to express the idea or to designate the act of attempting or undertaking something. In present usage it is appropriated by psychologists to the expression of desire and volition as manifested in or constituting voluntary agency, although as a factor in consciousness and effort its precise implications appear not to have been finally determined. In the exertion of the muscles, and in direct conscious attention, the agency of conation in an individual finds its two representative aspects. Attention, desire and endeavor, with their accompanying states of thought and feeling, are held by some psychologists to be the completing aspects of conation; while others maintain that its function is limited to the sensations of straining, with consequent states of consciousness, pleasureable or otherwise, attendant upon contraction of the muscles. Whether conation is to be regarded as simple or complex in its psychological aspects remains therefore a question for further research and experiment. Consult James, ‘Principles of Psychology’ (New York 1890); Titchener, ‘Experimental Psychology’

(New York 1901); 'Text-book of Psychology' (ib. 1910); Hyslop, 'Syllabus of Psychology'; Stout, 'Analytic Psychology' (London 1896).

CONATY, Thomas James, American Roman Catholic prelate: b. Ireland, 1 Aug. 1847; d. Coronado Beach, Cal., 18 Sept. 1915. In 1850 he came with his parents to America, the family settling in Taunton, Mass., and in the district schools of that city he received his primary education. He entered the college of Saint Sulpice, Montreal, in 1863, completed his humanities in 1867, and spent the following two years at Holy Cross College, Worcester, Mass., being graduated in 1869. His ecclesiastical course was pursued at the Seminary of Saint Sulpice, Montreal, where he was ordained priest 21 Dec. 1872. First named assistant at Saint John's Church, Worcester, Mass., and afterward chosen pastor of the church of the Sacred Heart in that city, Father Conaty was actively interested in the advancement of Catholic education. He was likewise an ardent promoter of the temperance cause, being first president of the Springfield Diocesan Temperance Union, and, in 1887, national president of the Catholic Abstinence Union of America. Father Conaty was also prominent in establishing the Catholic Summer School in 1892 — the same now flourishing at Plattsburg, N. Y. — being its president from 1893 to 1897. In 1889 Georgetown University conferred upon him the title of D.D., and in 1896 Laval University, Quebec, bestowed the same honor. He was chosen rector of the Catholic University in 1896, made a domestic prelate in 1897, consecrated titular bishop of Samos, 24 Nov. 1901, and appointed bishop of Monterey and Los Angeles, 27 March 1903. He was a frequent contributor to various periodicals, and is the author of 'New Testament Studies' now used in many Catholic schools.

CONCENTRATION CAMP, sometimes applied to rendezvous near an intended point of departure of troops; but generally to a camp into which non-combatants are gathered in time of war. During the Cuban rebellion of 1895–98 many peaceable and defenseless people were forced to abandon their homes in the agricultural regions and were imprisoned upon the barren waste outside the residence portions of the cities, and within the lines of entrenchment. It is estimated that at least 400,000 persons, mostly old men, women and children, were thus subjected to concentration under Weyler's administration. They were known as reconcentrados. The British also carried on a scheme of concentration of non-combatants — men, women and children — during the Great Boer War, and in which provision was made for the education of Boer children. Provision was made at Mindanao, in the Philippines, in 1902, for the accommodation of non-combatants during the military measures undertaken by the American government. In 1914 about 5,000 Mexican revolutionists, driven across the border into American territory by government forces, were disarmed and interned temporarily in concentration camps.

CONCENTRIC, similar figures having a common centre are called concentric.

CONCENTRIC WEATHERING. See Exfoliation.

CONCEPCIÓN, Bolivia, a lake in the central portion of the department of Santa Cruz.

CONCEPCIÓN, Chile, province lying between the provinces of Nuble and Bio-bio. Area 3,532 square miles. It is divided into the departments of Coelemu, Puchacay, Rere, Concepción, Talcahuano and Lautaro. The importance of its capital, its commercial activity and its numerous ports make this the most interesting province in the south of Chile. Two of the largest bays in the republic are on its coast, those of Talcahuano, which is defended by fortifications, and Arauco, which includes the ports of Lota and Coronel, notable for their coal mines. The city of Concepción (55,000 inhabitants) is the capital. Talcahuano (15,500 inhabitants) is a military port, with a dry-dock for repairing warships and mercantile vessels, and at the same time an active commercial port. Products of the whole southern region are brought to it for exportation, and it supplies cities of the interior with a large part of their merchandise. The port of Tomé (5,000 inhabitants), situated near rich agricultural districts, exports a large quantity of wine and has a woolen mill, etc. Penco, a small port 10 miles by rail from the city of Concepción, is a favorite seaside resort and has a sugar refinery and coal mines in the neighborhood. The population of the province is 225,000.

CONCEPCIÓN, Chile, the capital of the province of the same name. It is situated on the banks of the Bio-bio River, and is connected by a short railway with its ports of entry, Tomé and Talcahuano, eight miles distant on the Bay of Concepción. In the latter city a United States consular agent resides. The streets and squares of the city are wide, well paved, well lighted and clean. An electric railway traverses the principal streets. Concepción is the seat of a bishop. The chief buildings are the city hall, the cathedral, theatre, the agricultural school and the normal school. The city is in a fertile agricultural region and has an active trade in agricultural products, hides, tallow, wine, flour, beef, etc.; very little manufacturing is carried on, the largest establishment being breweries, furniture and carriage factories, saw-mills, flour-mills, distilleries, etc. It is in importance the third city of Chile. Concepción was founded in October 1550 by Pedro de Valdivia, and was originally situated on the site of the present city of Penco. In 1555 the place was pillaged and destroyed by Araucanian Indians; and in 1557 was refounded by Garcia Hurtado de Mendoza. In 1730 the town was totally ruined by an earthquake, and in 1751 suffered from a like catastrophe in consequence of which the site was removed and the city rebuilt in its present location in the fertile plain on the north side of the Bio-bio, 270 miles southwest of Santiago. At the time of the Spanish occupation Concepción was the second largest city in the country. In 1818 the declaration of Chilean independence took place here. In 1835 another disastrous earthquake visited the city and for a long time the place was almost entirely desolate, but it was afterward resettled and from that time the buildings have been more substantially and pretentiously erected, the streets reconstructed and the area of the city greatly extended. Pop. 55,000.

CONCEPCIÓN, Paraguay, also called Villa Concepción, the second city of the republic in commercial importance, though not in the number of its inhabitants. It is situated on the left bank of the Paraguay River, 125 miles from Asunción. It is a port of entry and delivery, where the steamers navigating the upper Paraguay regularly touch. The principal buildings are the city hall, custom-house, parish church, market and some fine private residences. It has a line of street-cars, telephone service, two banks, and several commercial houses that trade directly with Argentine and European cities. Yerba-maté or Paraguay tea and cattle are the principal items of the city's commerce. Pop. 15,000.

CONCEPCIÓN, Philippines, former district of the island of Panay, now part of the province of Iloilo, situated on the northeast part of the island; area 683 square miles. The former capital, Concepción is a pueblo situated on the east coast of the island, 47 miles northeast of Iloilo; pop. 4,565. Pop. of the district about 20,000.

CONCEPCIÓN, Philippines, town (pueblo) in Tarlac province in the island of Luzon, 12 miles south of the town of Tarlac. It has an important sugar industry; rice, tobacco and corn are also raised in the surrounding country. Pop. 12,593.

CONCEPCIÓN DEL URUGUAY, Argentina, city in the province of Entre Rios, on the Uruguay River about 160 miles north of Buenos Aires. It is connected by railway with Paraná, and the river is navigable for large vessels, thus rendering the city an important shipping point. It is in an extensive and fertile agricultural region and the trade consists chiefly of these products and cattle and packed meat. There are also some salting establishments in the city. A national college and a normal school are located in the city. Concepción del Uruguay was founded in 1778 and was originally called Concepción-del-de-la-china; was formerly the capital of the province and is now the episcopal city. Pop. 6,111.

CONCEPT. A concept is an idea which has been formed by thinking, and which is permanently embodied in language by a word or other definite symbolic expression. There are two main differences between a concept and a percept. In the first place, the latter seems to be directly presented through the senses and does not imply any conscious reflection. And again, a percept as presented has always a particular individual form, while a concept is an ideal construction, and, as such, has universal significance. For example, I may perceive through my senses the particular object which I call my watch; but to form a concept of «watch» is to think in general terms the relation of the mechanism of the parts to the purpose of the whole. The concept must also be distinguished from the mental image which appears in memory or imagination when the object is not directly present in sensation. The latter is always a particular psychological process, and therefore cannot adequately represent the general relations of the concept. We must not confuse the presence of images in the mind with thinking. It is true that a concept cannot be represented in terms of psychological content except by a particular image, and it probably always is represented by some such image. But the concept is a universal mode of thinking, and the psychological imagery which accompanies it is largely individual and indifferent. The universal relations of the concept of triangle, for example, are not limited by the form of the particular figure which I represent to myself mentally, or draw upon paper, though the latter may aid me in comprehending those relations. The concept is ideal in character; it is a universal significance, and must never be confused with a particular psychological image.

Socrates was the first to bring this universal element of knowledge into clear light. When the Sophists pointed to the differences and variations of perceptions and feelings in individuals, and drew the conclusion that objective knowledge was impossible, Socrates showed that concepts which are true for all men can be discovered and defined, and that this is the true quest of thought. Amid the flux of individual opinion, science is still possible, since it is constituted by this system of universal concepts. Plato and Aristotle developed further the Socratic doctrine of concepts and gave it an ontological application. By means of the concept, the true form or permanent essence of things is said to be apprehended, as opposed to the accidental and changing appearances. The question as to the nature of the concept played an important part during the Middle Ages. (See NOMINALISM, REALISM, CONCEPTUALISM). The view that is perhaps most commonly held to-day regards the concept as derived by abstraction (q.v.) from perceptual experience, by selecting out what is common in a number of instances and combining these common elements into a general idea. It must not be forgotten, however, that concepts are not formed by the piecing together of psychologically common elements in a mechanical way, but are the products of thinking; and that thinking is itself judgment or interpretation of significance in universal terms. It is true, as Kant said, that concepts without percepts are empty; our thinking does not go on in a vacuum apart from concrete experience. But the concept is not universal because it has been compounded out of elements that are common to a number of objects, but because it is the mind's expression in terms of ideal significance. Concepts, however, can attain to any degree of elaboration only through the aid of language. The relation between thought and the words which express it is of the closest and most intimate kind. The word sums up in itself the results of the conceptualizing process, thus giving to it a reality and permanence which make progress possible. It is through learning the words of a language that we are able to share in the concepts of other men and other generations. Language is thus a permanent record of thought's achievements, and its development is not something external to the evolution of thinking, but in one aspect may be said to be a different side of the same process. The concept then cannot be defined apart from its expression in language; for this expression is no mere external and accidental feature of the idea, but is organically and necessarily connected with it.

JAMES E. CREIGHTON,
Professor of Logic and Metaphysics, Cornell University.

CONCEPTION. This is a term signifying the beginning of the life of the child following fertilization, which latter is brought about by the union of the chromatic elements of the spermatozoon with the ovum. After orgasm (see Coitus), the male elements, or spermatozoa, many thousands of which are discharged in coitus, commence to move toward the mouth of the uterus, largely attracted by alkaline chemical substances which characterize the mucus membranes of the cervix and uterus. On entering the uterus they swim against a current there at a rate of about one-eighth of an inch a minute. The entire length of the uterus can thus be traveled in about an hour or less. The ovum may be met in the uterus or in the Fallopian tube when fertilization takes place. The spermatozoan may live from five to eight days in the uterus or tube — the ovum a similar length of time — and impregnation may take place at any period between menstruations, although it is more likely when coitus precedes or follows within seven to eight days of the mentsrual period. See Embryology.

CONCEPTION, Immaculate, of the Blessed Virgin Mary. A dogma of the Roman Catholic Church, defined as such by Pope Pius IX in 1854. See Immaculate Conception.

CONCEPTION OF OUR LADY, Sisters of the, an order of nuns, founded in Portugal in 1484 by Beatrix de Sylva, in honor of the Immaculate Conception. It was confirmed in 1489 by Pope Innocent VIII, and the Cistercian rule was adopted. In 1489 Cardinal Ximenes put the nuns under the direction of the Franciscans, and imposed on them the rule of Saint Clara. The order subsequently spread into Italy, Belgium and France. The Sisters of the Immaculate Conception of the order of Franciscans were established at Little Falls, Minn., in 1891 by sisters from Italy. They now have several hospitals, an orphanage, an extensive school and nearly 100 teachers.

CONCEPTUALISM, kŏn-sĕp'tū-al-ĭzm, in metaphysics, a doctrine in a sense intermediate between realism and nominalism. Conceptualism assigns to universals an existence which may be called logical or psychological, that is, independent of single objects, but dependent upon the mind of the thinking subject, in which they exist as notions or conceptions. Thus, for instance, according to conceptualism, the meaning of a general class-name as horse, red, can be fully represented in thought or be actually present to the consciousness. Locke was the best known advocate of this psychological doctrine, which is little known outside of English-speaking countries. See Nominalism; Realism.

CONCEPTUALIST, one of a metaphysical sect — if indeed it has coherence enough to be called a sect — which arose in the Middle Ages during disputes between the Nominalists and the Realists; or one who holds the views of conceptualism. The conceptualist school sought to occupy an intermediate position, but is approximated much more nearly to the Nominalists than to the Realists.

CONCERT, a public performance of musical compositions without the aid of scenic representation. They were unknown before 1672 when the first concerts were established in London by John Banister. Britton continued the practice after Banister's death in 1679 and in 1725 the *concerts spirituels* were established in Paris. The organization of the latter was soon copied by organizations in France, Germany and England. The foundation of the Berliner Singakademie in 1790 inaugurated public performances of large choral works with orchestra. Consult Hanslick, E., 'Geschichte des Konzertwesens in Wien' (Vienna 1869); Pohl, K. F., 'Mozart und Haydn in London' (Vienna 1867); Schering, A., 'Geschichte des instrumentalkonzerts bis auf die Gegenwart' (Leipzig 1905).

CONCERT PITCH, the pitch of a certain note in the musical scale adhered to by the general body of musicians. The middle C (seated on the ledger-line which unites the G and F clefs) is produced by a string making, according to theorists, 512 vibrations per second. In England, however, the pitch has risen to 538, while in Germany it is 528, and in France 522. The gradual rise of the pitch from the theoretical 512 vibrations is attributed to the necessities of piano-tuning on the one hand, and the desire to attain a more intense and brilliant tone on the other. See Pitch; also Musical Elements and Terms.

CONCERTINA, kŏn-sēr-tē-na, a musical instrument invented by Sir Charles Wheatstone in 1829. It is generally polygonal in shape, is held between the hands so that the fingers drop naturally down on studs which raise the valves and allow the air (supplied by the bellows between the finger-boards) to act upon a series of metal tongues of the same construction as those of the accordion or harmonium. The usual range of the instrument is from the lowest G on the violin to the C three and a half octaves higher, including the chromatic tones. The German concertina is a much less perfect instrument, as only tunes on a limited number of keys can be performed on it.

CONCERTO, kŏn-chär'to, a kind of composition first introduced by the Italian musicians of the 17th century, really a symphony with a solo instrument. The principal composers and artists in this department are Corelli, Viotti, Rodes, Baillot, Kreutzer, Alard, Beriot and Vieuxtemps. Subsequently concerti were written for other instruments, such as the flute, the piano, etc. Among the most successful composers for the piano are Bach, Mozart, Hummel, Chopin, Schumann, Ries, Czerny and Thalberg. Concerti are written in the so-called sonata or symphony form in three movements, an *allegro,* an *andante,* or *adagio* and a lively *rondo.* Except in the *tutti* the orchestra should be as subservient to the instrument for which the piece is written as it should to a vocalist. It is found for any instrument capable of technical or heroic treatment. Between the soli there are orchestral interludes — ritornelli, which most often treat the thematic material more fully. The *Concerto da Camera,* or *Chamber concerto* was popular before the days of full symphony orchestras, a string quartet and cembalo being sufficient to accompany the solo instrument. *Concerto da chiesa* or *church concerto* was more loosely applied, meaning often a work for voices and organ.

Concerto grosso is an expression applied to the great or grand chorus of the concert, or to those places of the concert in which the *ripienos* and every auxiliary instrument are brought into action, for the sake of contrast and to increase the effect. All the 18th century concerti for two or more solo instruments are *concerti grossi*.

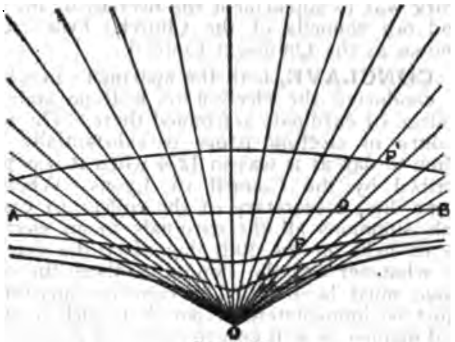
Concerto spirituale was a concert at Paris, performed in the religious seasons, when the theatres were closed. The pieces performed, however, were not always of a spiritual kind. It was introduced in 1725 by Anne Danican, called Philidor.

CONCH, kŏnk (univalve mollusks), a name of certain large marine gastropods, especially of the king conch (*Strombus gigas*), abundant in the southern United States and parts of the West Indies. In Florida the shells are made into horns used for calling the farm hands, as is still done in the East Indies with shells of the genus *Triton*. Conch shells were in use over a large extent of territory in Mexico, Central and the northern part of South America for the manufacture of beads many centuries before the discovery of America by Columbus. This is one of the shells used for making cameos, and great quantities are collected in the Bahamas and shipped to Liverpool for this purpose to some extent, but more for conversion into buttons and similar small articles, in allusion to which industry the native whites of the Bahamas are called "Conchs." Conch shells are also used very extensively in the manufacture of lime and porcelain. The name is also applied to two large sea-snails, the *Fulgur carica* and *Sycotypus canaliculata*, common on most parts of the Atlantic coast.

CONCHA, kŏn'chā, **José Gutierrez de la** (MARQUES DE LA HABANA), Spanish general: b. Cordova, Argentina, 4 June 1809; d. Madrid, Spain, 5 Nov. 1895. He went to Spain in childhood, entered the army, took part in the struggles in South America, and against Don Carlos, was appointed lieutenant-general in 1839, and officiated as captain-general of the Basque provinces 1843–46. He was captain-general of Cuba 1849–52, when he was replaced by Cañedo. Joining his brother Manuel (q.v.) in opposing the government, he was banished from Spain in 1854, and fled to France, where he was detained at Bordeaux. After the July revolution of 1854, he was reappointed captain-general of Cuba, and, with the exception of a short suspension of his functions by Narvaez's administration in 1856, when Lersundi was appointed as his successor, he continued to hold office until December 1858, when he tendered his resignation. Returning to Spain he was at various times Minister to France, president of the Senate and Minister of War, and captain-general of Cuba again 1874–75.

CONCHA, Manuel de la (MARQUES DE DUERO), Spanish general and statesman: b. Cordoba, Argentina, 25 April 1808; d. Muro, 28 June 1874. He was a brother of José Gutierrez de la Concha (q.v.), fought in early life against Napoleon and the revolted Spanish colonists in South America, and afterward against Don Carlos. In 1847, during the complications with Portugal, he was put in command of 6,000 men, and took possession of Oporto. Having issued at the end of 1853, in concert with O'Donnell and Bravo-Murillo, the famous protest against the policy pursued by the government, he was banished from Spain after the revolution of July 1854, and repaired to Paris; but was soon recalled to Madrid by the outbreak which terminated in the exile of Maria Christina, the downfall of Narvaez and the restoration of Espartero. Concha was now made inspector-general of cavalry and marshal; but on 12 Oct. 1856, when Narvaez came again into power, he was compelled to relinquish these posts. He was killed in the battle of Muro while serving in the republican army against the Carlists.

CONCHOID, kŏng'koid, a curve, shell-like in flexure (whence the name), invented by Nicomedes in the 2d century B.C., and used by him for finding two mean proportionals. If a straight line always passes through a fixed point O, and a point Q, fixed into the revolving line, always moves along the line A B, then any point P in the revolving line always at the same distance from V will trace out a conchoid. And, since the length Q P can in any position of the revolving line be measured either toward or from O, it is evident that, corresponding to any given length assigned to Q P, two conchoids can be described, one above and the other below the line A B. These are known as superior and inferior conchoids. Moreover, with a given point O, and a given straight line A B, any number of pairs of different conchoids can be described by varying the length Q P. Moreover, the shapes of all such curves will vary according to the length of Q P. Thus, if Q P is less than the perpendicular from O on A B, the shape is as given in the adjoining figure, and this isolated point O is also a point on the curve.



Conchoid

The equation of the conchoid is

$$x^2 = \frac{(b+y)^2(a^2-y^2)}{y^2}$$

when *a* denotes the length of the modulus and *b* the perpendicular distance from O to the line A B.

CONCHOLOGY, kŏn-kŏl'ō-jē, the science of shells. See MOLLUSCA.

CONCHOS, kŏn'chōs, or **CONCHAS,** Mexico, river in the state of Chihuahua; rises high up in the Sierra Madre, flows southeast, northeast and then north through a beautiful country, comprising rich table-land, and empties into the Rio Grande near Presidio del Norte, after a course of about 350 miles. It is the largest tributary of the Rio Grande, and very little inferior in size to that river itself. Its principal branches are the Florido, Buenavista, San Pedro, Chihuahua and Balleza, which, with their lesser tributaries, water more than one-third of the state.

CONCHYOLIN, kŏn-kī′ō-lĭn, an organic base allied to chitin (q.v.), which enters into the composition of the shells of mollusks. The conchyolin forms a thick cuticular layer of organic matter containing carbonate and a slight proportion of phosphate of lime. In dead shells the conchyolin soon disappears, leaving the shell much more brittle than when it was alive.

CONCIERGERIE, La, lä kôṅ-sē-ėr-zhė-rē. A noted prison in Paris, which was a part of the Palais de Justice. Many royal prisoners were there confined, and during the Reign of Terror it was the scene of fearful butcheries, 328 prisoners being put to death in one week. Marie Antoinette went from her cell in this prison to her execution.

CONCILIUM IN TRULLO, or **CONCILIUM QUINISEXTUM** (Council in Trullus, Fifth-Sixth Council). A council or synod of the Church convened in a hall (called the Trullus) of the Imperial palace at Constantinople in the year 692. It was an assembly of Eastern and Western bishops called for the purpose of enacting canons of Church discipline; this the council did, adding to the existing canons 102 new ones and confirming ancient canons that had fallen into desuetude. Its work was to supplement the decrees of the 5th and 6th councils of the Church: hence it is known as the Quinisext Council.

CONCLAVE, both the apartment in which is conducted the election of a Pope and the college of cardinals assembled there. The procedure in electing popes is substantially the same to-day as it was in 1274 when it was prescribed by the Council of Lyons. When a Pope dies, a secretary of the college of cardinals summons all the cardinals to an election to be held on the 10th day after the demise. In whatever city the Pope dies, there the conclave must be held. The conclave apartment must be immediately prepared in such a place and manner as will ensure safety of person and non-interference from outsiders. If the conclave is held in Rome, the great halls of one of the papal palaces are divided by wooden partitions into small rooms or cells, two or at most three cells for each cardinal and his personal attendants. The apartments all open on one corridor, and to that there is but one means of access from without, and that is strictly guarded. After the 10 days have elapsed, the cardinals all assemble in the Vatican church and assist at the Mass of the Holy Ghost, after which they form a procession and proceed to the conclave, each one taking the apartments assigned to him. The first day the conclave is open to the public, and numerous persons, high and low, avail themselves of the permission to enter. In the evening all outsiders leave, and the cardinals must remain until a Pope is chosen. A two-thirds majority vote is requisite. Since 1848 food is prepared in the conclave: if no election is had after five days the food supply is restricted to bread, wine and water, or rather used to be, for the rigor of the law is now much relaxed. A cardinal coming from a distance is admitted after closure. The election is made by scrutiny, that is, by ballot, or by compromise, that is, by a committee chosen by a majority of the conclave, or by acclamation. Formerly each cardinal in the name of his country had the right of excluding a candidate not acceptable to his government. This privilege he could exercise but once during the conclave. The last time this right of veto was allowed was at the conclave of 1903 when Cardinal Rampolla was excluded as obnoxious to Emperor Francis Joseph of Austria. On 20 Jan. 1904, Pius X prohibited any cardinal, under pain of excommunication, to exercise the right of veto. The cardinals take an oath to this effect. Cardinals only may vote, but non-cardinals are eligible to the Papacy. All are sworn to secrecy. No voting by proxy is allowed. A two-thirds vote is necessary to elect. Sometimes a conclave has sat many weeks, or even months, before reaching an election: the conclave which elected Pius VII (1799) sat during six months. The conclave in which Leo XIII was elected Pope consisted of 62 cardinals, and it began its session the evening of 18 Feb. 1878. The scrutiny of the morning of the 20th showed that Cardinal Pecci was chosen. The election was then ended and he was made Pope by acclamation. The conclave at which Pius X (q.v.) was elected began its session 31 July 1903, and the first ballot was cast the morning of 1 August. The scrutiny of the morning of 4 August, the seventh ballot, showed that Cardinal Sarto, patriarch of Venice, was elected. He chose the name of Pius X. This conclave was remarkable as being the first of which a cardinal from the United States was a member.

CONCONE, Giuseppe, joo-sĕp′pĕ kōn-kō′nā, Italian teacher of vocal music: b. Turin 1810; d. there, June 1861. From 1838–48 he was a teacher at Paris, and then became organist of the royal chapel at Turin. He wrote a large number of vocal exercises which are still used in the teaching of music.

CONCORD, Mass., town in Middlesex County, on the Concord River and on the Boston & M. Railroad, 20 miles northwest of Boston; settled in 1635. It is situated in a beautiful rural district, and has several manufacturing establishments. Here is located the Massachusetts Reformatory. The town has an excellent public library and a national bank. The government is by town council, and the municipality owns the waterworks and electric-light plants. At the beginning of the Revolution the Americans had a large stock of arms and military stores at Concord. General Gage, the British commander in Boston, hearing of this, sent a body of soldiers to destroy these stores, and on their way (19 April 1775) they fought the battle of Lexington, the first of the war. When they reached Concord, the same day, they destroyed what stores they could find, but were soon driven off by the Americans. Concord is celebrated as the home of many authors — of Ralph Waldo Emerson, Nathaniel Hawthorne, Henry David Thoreau, Amos Bronson Alcott, Louisa May Alcott, the poet William Ellery Channing and others. Pop. about 6,500. Consult Hurd, 'History of Middlesex County' (Philadelphia 1890).

CONCORD, N. C., county-seat of Cabarrus County, on the Southern Railroad. Here are large industrial interests, including cotton goods, foundry and machine-shop products, etc. There are also roller mills, a cannon manufactory and brick works. Concord is an old place to which in recent years new industries have brought rapid growth. The Jackson Training School and Scotia Seminary are located here. Pop. 8,715.

CONCORD, N. H., city, capital of the State and county-seat of Merrimack County, on the Merrimack River, and on the Boston & M. Railroad, 75 miles northwest of Boston. The city has an abundance of water-power, and manufactories of carriages, shoes, twine, electrical apparatus, silverware, leather goods, machine-shop products, etc. The United States census of manufactures for 1914 recorded 86 industrial establishments of factory grade, employing 3,178 persons; of these, 2,856 were wage earners, receiving annually $1,956,000 in wages. The capital invested aggregated $5,701,000, and the year's output was valued at $6,744,000: of this, $3,032,000 was the value added by manufacture. Near Concord are extensive quarries of a fine-grained white granite. There are three national banks with a combined capital of $550,000 and a surplus of $779,000, and several private banking houses. The assessed property valuation exceeds $20,000,000. The city is well laid out, has finely shaded streets, is well lighted, and its waterworks are excellently constructed. The noteworthy buildings include the State-house, a fine building of Concord granite, the city hall and courthouse, the State prison, State insane asylum and the United States government buildings. The public schools are 26 in number and are admirably organized and conducted, and represent a property valued at more than $325,000. This city is the seat of the well-known Saint Paul's School (Episcopal) for boys. Concord was settled by whites in 1725, on the site of the Indian village of Pennacock. It was called by this name until 1733, then incorporated as the town of Rumford, and became a city in 1853. It is noted as the place near where Hannah Dustin (q.v.) made her escape from Indian captors. Pop. 22,000.

CONCORD, an expression used in music denoting the combination of two or more sounds pleasing to the ear, and requiring no further combination before or after it to make it so. Concords are the eighth (or octave), the fifth, third and sixth. Their ratios are 2:1, 3:2, 5:4, 5:3. The two first are called perfect, because as concords they are not liable to any alteration by sharps or flats. The two last are called imperfect, as being alterable. The fourth is considered as a discord by some authorities; as a component part of an inversion of the perfect chord it may be classed among the concords. See Counterpoint.

CONCORD, Book of (*Liber Concordia*), the name given to a collection of confessions of faith which are generally accepted by the Lutheran Church. The Formula of Concord (1580) was the result of a series of conferences and discussions upon the following subjects: The Rule of Faith and the Creed; Original Sin; Free Will; Justification; Good Works; The Law and the Gospel; The Third Use of the Law; The Lord's Supper; The Person of Christ; The Descent of Christ into Hell; The Customs of the Church; Predestination and Election; Heresies and Sectaries. The whole received the sanction of a large number of the Germans. Other subjects treated in the Book of Concord are The Three Ecumenical Creeds — Apostles, Nicene and Athanasian; The Six Particular Confessions of the Lutheran Church — Augsburg, Apology of the Augsburg, Schmalkald Articles, Catechisms of Luther (larger and smaller). Consult Schaff, 'Creeds of Christendom' (Vols. I and III, New York 1878).

CONCORDANCE, a book in which the more important words of a volume or collection of writings are arranged alphabetically, part of a passage being extracted with each and the place of its use specifically given. The first known concordance of the Bible in any language was that of Saint Anthony of Padua, who was born in 1195, and died in 1231. His work was called 'Concordantiæ Morales,' and was of the Latin Vulgate. It formed the basis of a more elaborate concordance, also of the Vulgate, that of Hugo de Santo Caro, better known as Cardinal Hugo. This was published in 1244 A.D. The first Hebrew concordance was that of Rabbi Mordecai Nathan, begun in 1438 and finished in 1448. The first Greek concordance to the New Testament was that of Xystus Betuleius, whose real name was Birck; it came forth in 1546 A.D. The first English concordance to the New Testament was that of Thomas Gybson, before 1540 A.D.; the first to the whole English version of the Bible that of Marbeck, 1550 A.D. These, of course, preceded the appearance in 1611 A.D. of the authorized version of the Bible. The elaborate and well-known work of Cruden appeared first in 1737. All these works, with the exception of the last named, have been superseded by vastly improved works by modern scholars. Of the Septuagint the standard is that by Hatch and Redpath (London 1897); of the Vulgate, that by Coornaert (Bruges 1892), and that by Peultier, Etienne and Gantois (Paris 1902); of the Hebrew Bible the best is that by Furst and Delitzsch, in Latin (Leipzig 1841) and also that by Davidson, Tregelles and others, in English (London 1873); of the Greek New Testament are those of Bruder (Leipzig 1842; 5th ed., Göttingen 1900); in English Moultrie and Gedden (New York 1897); of Luther's Bible the best is that of Büchner (Jena 1740; 23d ed., Berlin 1899); of the English Bible in addition to Cruder are those by Young (Edinburgh 1879), Walker (Boston 1874) and Strong (New York 1894).

Scholars have also compiled concordances of the works of several great authors. The first known concordance to Shakespeare was that of Ayscough, in 1790. Mrs. Mary Cowden Clarke's elaborate and most useful work was first published in London in 1845, and in 1894 appeared a still more excellent one, that of John Bartlett, published in New York. A concordance to Milton was published in Madras in 1856 and 1857, and one to Tennyson in London in 1870 and another in 1912. Others of this kind are 'Dante's Works,' by E. A. Fay (Boston 1889); 'Omar Khayyam,' by J. R. Fultin (London 1899); 'Chaucer,' by the Chaucer Society (London 1872–); 'Pope,' by E. Abbott (ib. 1875); 'Cowper's Poetical Works,' by J. Neve (ib. 1887); 'Gray,' by A. S. Cook (ib. 1909); 'Dickens,' by G. A. Pierce (ib. 1898); and by Williams (ib. 1907); 'Browning,' by Molineux (New York 1896).

CONCORDAT, kŏn-kôr'dăt (*concordatum*, or, plur., *concordata*), a compact or convention entered into by the Holy See and a secular government to determine their respective powers and rights in the regulation of ecclesiastical affairs within the jurisdiction of the state which is a party to the compact. The earliest example of such compacts is the convention between Calixtus II and the Emperor Henry V, concluded at Worms in 1122: it marked the end of the great dispute about investitures. In 1448 was concluded the so-called concordat with the German nation, or with the Emperor Frederic III, under which the patronage of ecclesiastical dignities in the empire was divided between the Imperial Crown and the Holy See.

A more comprehensive compact is that of which the foundation was laid at Constance in 1848, and subsequently modified by the Frankfort Concordat, and by that of Vienna, which last continued in use till the end of the Holy Roman Empire in 1803. Its place was supplied, under Pius VII and his successors, by separate concordats with Bavaria, 1817; Prussia, 1821; Baden, Würtemberg and several small states in 1818; Hanover, 1824; Saxony, 1827, and the Netherlands, 1827. A concordat was concluded at Vienna in 1855. Its chief provisions were that the Pope should have direct communication with the bishops, clergy and people; and archbishops and bishops with their priests and people, and the right to govern their sees according to the canon law. Education was put under the control of the Church. The bishops were to settle what books should be used. All questions of marriage, except so far as they involved civil consequences, were reserved exclusively to the ecclesiastical courts. The emperor had the power of choosing bishops, but with the advice of the existing bishops. The Church might acquire new property; but once acquired, it should not be sold or mortgaged without the consent of both Pope and Emperor. In 1868 this concordat was set aside in all the dominions of the Emperor of Austria.

In Italy, an agreement regulating the election of bishops was concluded with Nice and Savoy in 1451, and a formal concordat was made with Sardinia by Benedict XIV in 1740, and with Naples in 1741, and a new concordat was entered into with Naples by Pius VII in 1818. Charles V of Spain concluded a concordat with Adrian VI and Clement VII, and a further concordat was made by Clement XII and Philip V in 1737. A concordat with Portugal was made by Benedict XIV in 1741. Memorable is the concordat of 1515 between Leo X and Francis I; the King agreed to annul the pragmatic sanction of Charles VII, which restricted the right of appeal to Rome; and in return the Pope conceded to the king the right of nomination to all Church benefices within the realm, with a reservation of the *annates* to the Holy See, and with the proviso that the nominees should be acceptable to the Pope. Another celebrated corcordat is that concluded 15 July 1801 between Pius VII and Napoleon as First Consul; it recognized the legal existence of the Catholic Church in France which had been annulled by the Revolution. The ecclesiastical topography of France was altered, the number of episcopal sees being reduced from more than 100 to 80. The confiscation of ecclesiastical property by the republican government was to pass for *fait accompli* and *res judicata* and the Pope and his successors were not to move to disturb purchasers or grantees of such properties. The government was to have the right of nomination of bishops, but the Pope that of canonical institution. Provision was to be made by the state for the support of bishops and clergy in lieu of their property, which had been appropriated by the Revolutionary government. Immediately after the concordat was concluded there arose in France an agitation for its abrogation, and this agitation grew more insistent than ever after the Dreyfus affair (q.v.) and the Concordat was abrogated finally in 1906.

CONCORDIA, or CONCORD, personified and worshipped as a goddess in Rome, where she had several temples, the most important of which was that in the Forum, erected by Camillus in 367 B.C. An annual feast was celebrated in her honor 16 January. She was represented with wreaths of flowers on her head, and in one hand a cornucopia, in the other an olive branch or a *patera*.

CONCORDIA, Argentina, town of the state of Entre Rios, on the Uruguay, 302 miles north of Buenos Aires by river. It has oil mills and slaughter-houses. It has a custom-house and a river trade exceeded only by that of Buenos Aires and Rosario, exporting salted meat, leather and Paraguay tea. It has railway connection with Paraná, Uruguay and South Brazil. Pop. about 13,000.

CONCORDIA, Kans., city and county-seat of Cloud County, situated on the Republican River and on the Atchison, Topeka and Santa Fé, the Missouri Pacific and the Union Pacific and other railroads, 110 miles northwest of Topeka. It has good water power and shows considerable manufacturing activity. There are iron-works, grain elevators, creameries, produce-packing plants and flour mills and factories for making plows, wagons and cigars, brick and cement blocks. The city contains Nazareth Academy, Saint Aloysius' School, Saint Joseph's Hospital and a Carnegie library. Pop. 4,415.

CONCORDIA COLLEGE, an educational institution in Fort Wayne, Ind., organized in 1839 under the auspices of the Lutheran Church; reported at the end of 1915: Professors and instructors, 12; students, 261; volumes in the library, 10,000; grounds and buildings valued at $100,000; income, $12,400; number of graduates, about 1,000.

CONCRETE (from Latin *concretus*, «that which is grown together»), an artificial stone, a composition of hydraulic cement, sand and broken stone, used for a long time for submarine foundations, and since 1890 more and more in place of building stone. In place of hydraulic cement pure lime was originally used and the name concrete applied only to this compound, «beton» being the proper term for the composition based on hydraulic cement until it became the only method. The mixture of sand

and cement is termed the matrix, and the broken stone or other addition is styled aggregate and is composed usually of local crushed stone, but may be slag, coke, broken bricks, gravel or pebbles. The ideal aggregate is broken, sharply angular and irregular stone, as this material mixes better with the matrix than rounded pebbles, minute particles of gravel or the more spongy brick shell or coke, although broken stone or gravel may be used advantageously in connection with pebbles, even in such small proportion as three to five. Broken limestone is considered especially efficacious as an aggregate, possibly because of an affinity between the molecules of carbonate of lime in it and the matrix. The proportions of the various parts approximate 1 part of cement, 3 parts of sand and 4 to 6 parts of aggregate, but no fixed norm is to be followed, the true rule being that the cement paste is to be thoroughly incorporated with sand coating each particle and that the matrix thus formed shall fill all interstices in the aggregate. In the process of mixture there are two extreme methods of watering, one very wet and the other scarcely more than moist. The spraying is followed by a mixture by shovel or by mixing machines. These machines are of two types: continuous, a trough or cylinder with a revolving screw shaft which works until the mixture is complete; and intermittent, a box being rotated slowly. The concrete may either be made into blocks, one layer of comparatively small depth being made at a time. By the newer method it is applied to its place on the building or foundation in the soft state and allowed to harden there. The world is indebted to Germany for the revivification of the concrete industry. They diffused a wider knowledge of the artificial manufacture of cement from lime and clay (see PORTLAND CEMENT), and demonstrated that the degree of expansion and contraction of structural steel and concrete under changes of temperature were the same. The United States was very prompt to make use of this development, which has so greatly altered building construction throughout the civilized world. While the large use of concrete is a comparatively modern development, it was employed in ancient times and in some of the most renowned works of history. The factitious stones employed by the Babylonians and the early Egyptians, as well as among the Greeks and Romans and at the present day in Barbary and among the nations of Malabar, were all a species of beton. Pliny mentions that the columns which adorn the peristyle of the Egyptian labyrinth were of this material, and the great length of time it has existed (over 3,600 years) shows the durability of this mode of construction. Puzzonlana, a volcanic earth, formed the basis for an excellent natural hydraulic cement used by the Romans. The aggregate consists of broken stone and was poured in wooden molds. In Rome the pyramid of Ninus is formed of a single block, as was also the square stone that formed the tomb of Porsena, which was 30 feet wide by 5 feet high. The Romans made free use of this material in constructing their walls, aqueducts, piers and roads, many portions of which exist at the present day. The mole which shelters the harbor of Algiers is so much exposed to the effect of winds that breaches were continually being made in it by the force of the sea, and to such an extent that in former times the Moors were compelled to employ a large number of workmen constantly repairing it, at an annual expenditure of over $60,000. Between 1833 and 1840 the French rebuilt this with concrete, or beton as it was then called, this being among the earliest of modern successful use of artificial cement-made stone. The action of the sea is so tempestuous here that the engineers calculated that stone blocks would have to be of about 350 cubic feet to remain in place. The impracticability of quarrying and transporting such enormous blocks of stone led to the employment of artificial stone or beton. Two kinds of blocks were manufactured: the first in the water, in the place they were intended to occupy, and the second on shore, to be afterward thrown into the sea. In the process of reconstruction, these blocks were used as follows: Those of the first kind, made in lined caissons, formed an outer sea line; on these blocks molds were placed filled with beton, and after these second blocks had set, they were launched into the sea, forming a line in front of the first; the intervening space was then filled up with blocks of natural stone. Behind this embankment thus formed, the ground was dredged to a depth of over six feet, and the whole of this space filled up with a continuous mass of beton. The entire work was performed in five years, at a cost of less than $420,000, notwithstanding that the mole, at the time of the occupation of Algiers by the French army in 1830, was in a state of complete dilapidation, in spite of the extensive repairs which had been annually executed upon it by the Moors during a period of two centuries. Marine works of the above character present numerous advantages over constructions in which natural stone is employed, of which the following are some of the most prominent: (1) immediate stability, while ordinary *pierre perdue* is never secure; (2) incomparably greater facility in transportation, which is always expensive and troublesome when blocks of stone are to be quarried exceeding 100 cubic feet; (3) a considerable reduction in the sectional area of the pier, and consequent economy of cost; and (4) that the system can be applied in every locality, now that our advanced knowledge of the subject of hydraulic mortars enables us to manufacture beton in any place where it may be needed. See CONCRETE BRIDGES; CONCRETE CONSTRUCTION; PORTLAND CEMENT.

CONCRETE BRIDGES. These include arch, girder, slab, truss and trestle forms. The location of piers, length of span and thicknesses of main members will be determined by the character of foundations and loading to be carried; the width by the traffic, and the height by high water mark, and adjoining property, and the length of flood discharge, and channel width. The character of finish, ornamentation and other æsthetic features will be determined by the situation. Since concrete bridges are permanent, they should provide for increased loading of future. On important highways, motor trucks of 30 tons must be carried; and on interurban bridges, from electric cars of from 75 tons to electric locomotives of 100 tons.

Reinforced Concrete Arches are either of closed-spandrel or of open-spandrel type. The first type is similar in form to a stone masonry arch, with thinner sections. The reinforcement should be about 1 per cent of the crown section in both extrados and intrados, and should continue throughout the arch ring, bonding into the piers. The two lines of reinforcement should be connected with substantial wiring, sufficient to transmit stresses. Reinforcement should run transversely to the arch ring and be tied in the spandrel walls. Reinforcement may be preferably rods, or a light built-up framework of structural shapes (Melan System). W. J. Douglas ('American Civil Engineer's Pocket Book') gives a formula for the cost of a reinforced concrete bridge with ordinary foundations as follows: Cost in dollars $= 0.8\,bl\sqrt{d}$ where $b =$ width in feet, $l =$ length in feet and $d =$ average depth in feet of bed of stream below roadway level (1916).

Arch bridges are developing into the open spandrel type, becoming more articulated and skeletonized; similar to the development from the Romanesque to the Gothic cathedral. In the open spandrel type, the loads are carried by a slab deck to transverse walls or columns, and in turn by these to the arch ring. A further development is to divide the arch ring into two or more separate ribs upon which columns rest to carry the load of the deck. The extreme articulation of the Arroyo Seco Bridge is notable.

By such skeletonization, the designer can more certainly arrange the shape of the arch ring to the load, span and rise, and more economically carry the loads and reduce the weight upon the foundation. The subsequent life of the structure due to expansion can be better provided for. Waterproofing is also more simple.

For high rise bridges of usual width the open-spandrel type is more economical. Closed-spandrel, earth-filled arches, when of low rise and under 100 foot in span, are usually more economical than open-spandrel arches.

In both open- and closed-spandrel types sidewalks may project beyond the faces of the structure and so reduce the length of the pier.

Form of Arch Rings.— When circumstances of waterway and head room permit, the shape of the arch ring may be chosen from the standpoint of economy, and will then vary with the character of loading. For instance when the load is uniform per horizontal unit of length, as in open-spandrel structures, the parabolic curve is chosen (see *Arroyo-Seco* Bridge). For closed-spandrel, earth-filled arches with a ratio of rise to span greater than one-fourth, an ellipse is suitable, and when this ratio is less the curve should be between a segment of a circle and an ellipse. In this case the curve is approximated to by a three or five-centered curve. An arch springing down low upon the piers imposes less transverse action on the pier.

Expansion and contractions due to change of temperature must be provided for in concrete bridges. Heavy concrete sections demand provision for a range of 35°C. or 40°C. only. Sliding joints provide for movement of floor system and must often be waterproofed.

Thickness of Arch Rings.— Empirical formulas for determining the thickness of arch rings at crown are generally used. The thickness of an arch ring should increase toward the spring, except for hinged arches. The radical thickness at any point may be taken as the crown thickness, multiplied by the secant of the angle which the radial section makes with the vertical. For segmental and three-centred arches the thickness at the spring is from two to three times the crown thickness. However these dimensions, useful for preliminary plans, should always be checked by an analysis, using the method of the elastic theory.

The appearance of concrete arches must often receive attention and at times they are faced with cut stone. However, by the use of selected aggregates, or by tooling and setting of tiling, ornamental appearances are secured, and are preserved, when the arch is properly waterproofed. It is of importance, however, that arch lines and surfaces be kept simple and accentuated, and not lost in inappropriate and meaningless applications of ornament. The use of pedestals, massive lighting standards is satisfactory. The design of overhangs, off-sets, pilasters gives relief from the flatness.

In the United States, arch rings are usually built continuous with the piers. Rarely in this country, but more often in Europe, the arch ring is built in two parts with hinges at the crown and at the abutments, with the object of fixing the action line of the loads, thus lessening the flexure on the ring, and the effects of change of temperature.

Cantilever Concrete Bridges have the appearance of arches but are composed of balanced cantilevers. These are suited to spans too long for girders; and, since they exert only a vertical pressure, they will fit foundation conditions too yielding to withstand the thrust of a real arch. The cantilever arms are ribs supporting a slab and beam deck. Examples of such highway structures are Hopple Street, Cincinnati, Ohio, 70-foot span; Wayne County, Mich., 100-foot 6-inch span; Runnymede Avenue, Cincinnati, Ohio, 72-foot span; Washington Street Bridge, Norfolk, Conn., 50-foot span.

Bowstring and Open-web Cased Girders are common in Europe and increasing in the United States in cases where arch construction through limitations of heading or foundation conditions do not permit an arch.

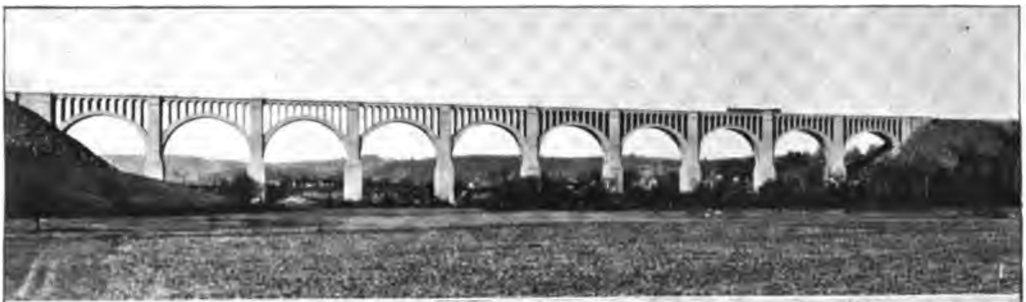
The Benson Street Bridge over Mill Creek, at Lockland, Ohio, is an example of an arch with a suspended floor consisting of slabs and girders to which suspenders are attached.

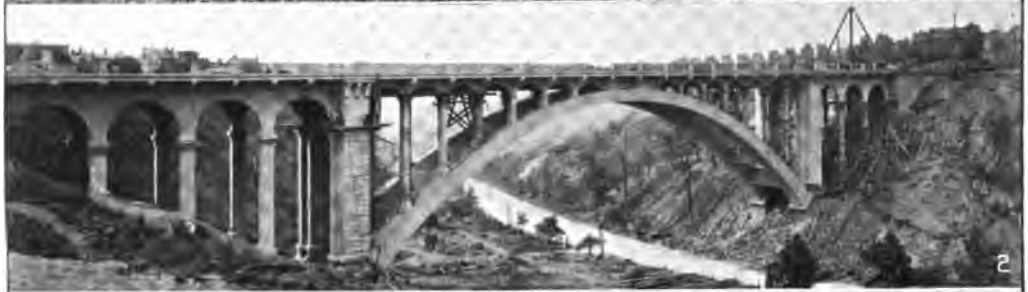
Slab Bridges, used up to 25-foot span, consist of a simple slab span to which the parapets are attached, resting on abutments. A highway bridge of 22-foot span, for instance, has a slab thickness of 12½ inches, reinforced with rods, spaced 5½ inches c.c.; and parapets 41½ inches above the slab; ½-inch rods spaced 12 inches c.c. run transversely to the bridge. Expansion sliding joints of tarred paper or galvanized iron are placed on top of the abutments. Vertical drain pipes drain the roadway.

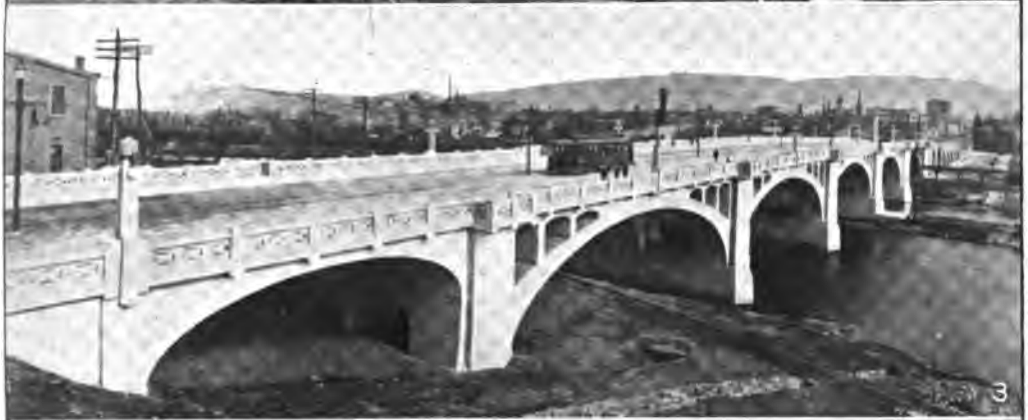
Girder Bridges are used up to 50 feet span and may be preferably of deck type, where there is headroom, or of the through type. The two or more girders receive the deck slab. A span of 30 feet, for instance, has three girders 17 inches wide and 2 feet 9 inches deep below the deck slab, which is 10 inches thick. For additional information see BRIDGE.

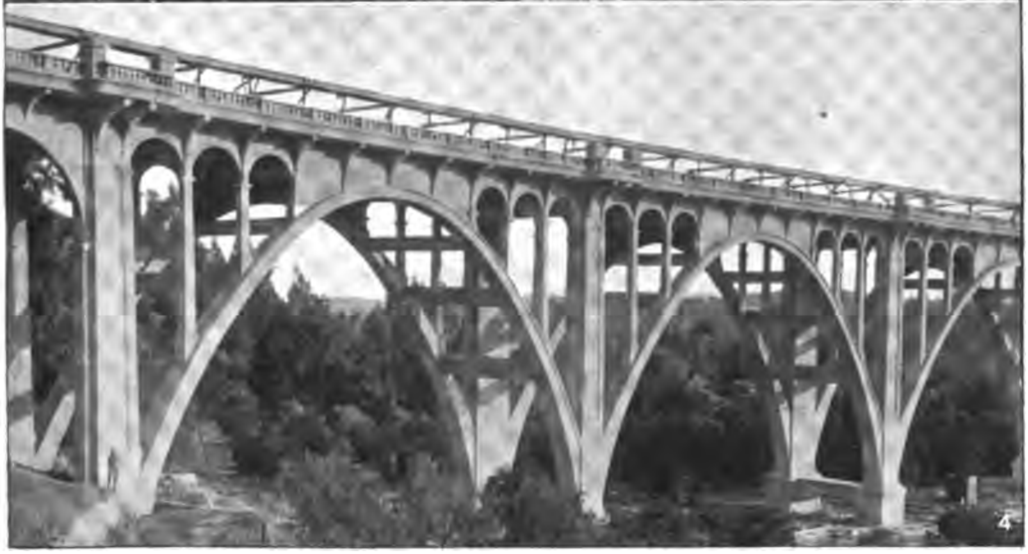
Railroad Trestles are built by placing previously molded slabs on concrete bents, spaced

CONCRETE BRIDGES









1 Tunkhannock Creek Viaduct, Lackawanna Railroad
2 Larimer Avenue Bridge, Pittsburgh, Pa.
3 Arde Bridge at Reading, Pa.
4 Bridge over Arroyo Seco, Pasadena, Cal.

EXAMPLES OF LONG SPAN CONCRETE ARCHES

NAME AND LOCATION	Loading	Span feet	Rise feet	Thickness at crown in feet		Curve	Spandrel
				Solid rib	2-rib		
Plain Concrete							
Connecticut avenue, Washington, D. C.	H.	150	75.0	5.0	....	Circ.....	Open
Munderkingen, Wurtemberg	H.	164	16.4	3.4	....	....	....
Oviedo, Spain	H.	165	18.0	3.7	....	....	....
Neckerhausen, Germany	H.	165	13.5	2.8	....	....	....
Walnut lane, Philadelphia	H.	233	70.3	5.5	....	....	....
Reinforced Concrete							
Missouri Standard	H.	40	8.0	1.2	....	Segm....	Solid
Stinson Creek Branch, Fulton, Mo.	H.	66	15.0	......	2.6 4.0 wide	Segm...	Open
Elk's Run, W. C. F. & N. Ry	Ry.	70	16.0	2.7	....	5-centre..	Solid
Danville, Va	H.	79	8.0	......	2.4 2.6 wide	Segm....	Deck on 2 ribs
Yardley, P. & R. Ry	Ry.	90	35.0	3.6	....	Segm....	Solid
Atherton Avenue, Pittsburgh	H.	90	45.0	4.6	....	Segm....	Solid
Main street, Fort Worth, Tex	H.	105	48.0	......	6.0.........	Segm....	Deck on 3 hinge
Arroyo Seco, California	H.	105	45.0	......	2.0.........	Parabolic.	Open
Monessen Viaduct, Pennsylvania	H.	150	53.9	......	4.5 4.5 wide	Parabolic.	Open
Chatellerault, France	H.	164	15.8	1.8	....	Circ.....	....
Route Bormida, Italy	H.	167	16.7	1.9	....	....	....
Tunkhannock, D., L. & W. Ry	Ry.	180	90.0	......	8.0 14.0 wide	Segm....	....
Decize, France	H.	183	15.3	1.6	....	....	....
Gruenwald, Munich, Bavaria	H.	230	42.0	2.5	....	3-hinged..	Open
Walnut lane, Philadelphia, Pa	H.	233	70.0	......	5.5.........	Segm....	Open
Monroe Street, Spokane, Wash	H.	281	115.0	......	6.8.........	....	Open
Larimer Avenue, Pittsburgh	H.	300	67.0	......	8.0 8.0 wide	Segm....	Open
Tiber River, Rome, Italy	H.	328	32.8	0.7	....	....	Cellular

15 to 20 feet, composed of concrete of vertical piles and a concrete cap. They are also built in place.

W. K. HATT,
Professor of Civil Engineering, Purdue University.

CONCRETE CONSTRUCTION. A Historical Account.— As in the history of other arts we find early disclosures of the principles of action of various later constructions. Before construction in reinforced concrete strengthening of brick masonry arches by iron ties to prevent opening of cracks in tension was well known. In 1836 Brinell experimented with brick beams so strengthened and found the two acted together. In 1871 Sir Shafto Adair built a concrete arch of 50-foot span with a rise of five feet three inches, containing an embedded iron skeleton frame. The treatise on concrete by François Coignet, of France, published in 1861, describes the embedment of an iron mesh work in concrete to increase its resistance to tension, and describes the making of pipes. It is said that he built a roof slab 12 inches thick and 20-foot span, in 1852 at Saint Denis. (*Concrete*, London, June 1910).

Coignet's patent of 1869 consists in the introduction in the body of the structure of double headed nails, double T pieces, clamps, hoops — for the purpose of strengthening some and giving it greater cohesive strength. The iron was to be interlaced so that by the combination of the metallic skeleton and of agglomerated artificial stone paste the thickness of the walls or size of articles might be considerably reduced and yet great strength be attained. Troughs were to be strengthened at the corners by iron clamps.

The book by Thaddeus Hyatt published in 1877 discloses improvements in fireproof construction, describes experiments in reinforced concrete beams and analyzes the principles of action of these. He protects the I beams from fire by a covering of concrete, and between these he builds slabs reinforced for tension by plates of iron placed vertically in the bottom of the slab and connected by small round rods. He understands the mechanics of the reinforced concrete beam; and the part played by the metal in moment and horizontal shear. He also investigated experimentally the elements of strength of the two materials, strength, modulus of elasticity, expansion and contraction, fireproof qualities. Hyatt was a practical contractor, a successful inventor, and his book is the first definite treatment of reinforced concrete.

J. F. Monier, a gardener, was one of the fathers of reinforced concrete. His first work was in making flower pots. His first patent was dated 1867 and the drawings disclose many of the elements to-day employed. In 1884 the rights of the Monier patents for Germany were purchased by Wayss & Company, which, after experimental and theoretical study, published a brochure entitled 'Das System Monier,' describing the various engineering applications of reinforced concrete. Following this it was rapidly introduced in the construction of buildings, railroad structures and public works. In 1892 the important names of Hennebique and E. Coignet appear. Their designs of beams and bridges extended reinforced concrete to a new construction of a monolithic character. In eight years, between 1892 and 1899, Hennebique applied reinforced concrete to 3,000 constructions, including bridges, buildings, stairways, retaining walls, reservoirs, piles, etc. Other well-known practitioners of that time are Cottaucin, Bordenave, Bonna, Matrai, Melan. The French Exposition of 1890 showed many remarkable structures in reinforced concrete. Considere after 1900 brought new ideas. Since then the range of size and importance has been extended, scientific data for accurate computation determined experimentally, and principles of action more clearly known.

In the United States, Ransome in 1884–95 was building various structures with hoop iron and wire rope. A house of reinforced concrete with beams and slabs was built in the United States by Ward in 1875. Thatcher applied the Melan system to bridges. J. Kahn and A. L. Johnson designed and built up a wide range of structures. After 1902 the university laboratories were fruitful in research. For further reference consult P. Christophe, 'Le Bèton Armè' (ed. by Béranger, Paris).

Composition.— Concrete here considered is composed of hydraulic cement (generally Portland cement) and a fine and coarse aggregate and water. Mortar is composed of cement, fine aggregate, and water. Subsequently the mixture sets by chemical action. Fine aggregate is usually sand but may be crushed stone or gravel screenings graded from fine to coarse up to ¼-inch size; the coarse aggregate is pebbles, broken stone or slag, up to a size depending upon use. For buildings and bridges where steel reinforcing is used the maximum size should be not greater than ½ inch. For concrete in large masses, such as piers, sizes up to 2½ inches may be used. Under proper precautions large boulders may be embedded in the concrete. Occasionally banks of gravel are found of approximately the proper proportions of fine and coarse aggregate. For mass concrete cinders, composed of hard, clean, vitreous clinks free from sulphides, unburned coal or ashes may be used. The fine aggregate should be hard, free from organic matter; 5 per cent of clay, if finely divided and nonadherent, may be allowed. Not more than 6 per cent of fine aggregate should pass a standard sieve having 100 meshes to the inch. Dirty sand when rubbed in the palm will discolor the hand. Avoid very fine sand. Sand or gravel is cleaned by washing.

Proportions.— For reinforced concrete construction for structural concrete, engine foundations, tanks, arches, a real rich proportion of 1 part cement to 6 parts of fine and coarse aggregates by volume; usually 1 cement, 2 sand, 4 broken stone or pebbles (1:2:4). For reinforced columns up to 1:1:2. For ordinary foundations, walls of buildings, floors, sidewalls, use 1:2½:5. For heavy walls, piers and abutments, an ordinary mixture of 1:3:6. For unimportant work, in large mass, as ordinary foundations, backing, farm floors, a lean mixture of 1:4:8 may be used if well handled. These proportions assume that the voids to be filled in the fine and coarse aggregate approximate 50 per cent. In important work the most favorable proportions to yield the densest mixture are determined by experiment. A grading of sizes of aggregate approximating an ellipse, vertex at zero size, is the ideal.

Mixing should continue for at least one minute in a batch concrete machine mixer. If mixed by hand ingredients should be turned at least six times on a watertight platform until homogeneous in color. The cement should be spread on the sand and the two well mixed by turning over three times. Then place this on the coarse aggregate, add the water and turn over. Generally the amount of water should be such as to yield a plastic concrete, whose surface will be horizontal in a container, but in which the coarse aggregate will not sink. However, a dryer concrete may be tamped into place for foundations, walks, curbing, etc. Before mixing and placing concrete should not be allowed to set. Fresh concrete, as on a subsequent day, should not be placed on partially set concrete until the old surface has been cleaned of laitance or dirt, roughened and wetted, and slushed with a mortar of 1 part cement to 2 parts fine aggregate.

Concrete should not be deposited in freezing weather unless special precautions are taken to heat the aggregate, the water and to protect the concrete. Salt is used to lower the freezing point of the water in amount of 1 per cent of the weight of the water for a temperature of 32° F. and an increase of one per cent for each degree of lower temperature to a maximum of 10 per cent. The strength of the concrete is not greatly affected. Salt should not be used in reinforced concrete. Wet concrete may be continuously placed under still water by use of a tremie or pipe with lower end buried in the flowing mass.

Usually forms of wood or steel are required to hold concrete to the desired shape while hardening. Accidents are likely when forms are removed too soon. Two weeks to one month in important structures are needed. A simple test is that a tenpenny nail will bend and not drive in concrete. Frozen concrete may be detected with a torch. Expert inspection is necessary where collapse is possible.

Strength.— The following table gives the expected compressive strength of various concretes at 28 days, in pounds per square inch:

AGGREGATE	1:1:2	1:1½:3	1:2:4	1:2½:5	1:3:6	Wt. lbs. per cu. ft. 1:2:4
Granite, Trap. rock	3,300	2,800	2,200	1,800	1,400	160
Gravel, hard limestone and hard sandstone	3,000	2,500	2,000	1,600	1,300	155
Soft limestone and soft sandstone	2,200	1,890	1,500	1,200	1,000	148–143
Cinders	800	700	600	500	400	112

The expected strength of 1:2:4 concrete at 28 days is 2,000 pounds per square inch. The *tensile strength* is about one-tenth and the shearing strength about two-thirds the compressive strength. True shearing failures are difficult to procure; usually tensile failures result.

The modulus of elasticity ranges from 2,500,000 to 3,000,000 pounds per square inch. Usually in design it is assumed to be 2,000,000, or one-fifteenth that of steel. The bond or resistance to withdrawing steel or iron rods from 1:2:4 concrete at 28 days is: For plain and deformed rods at first slip, 260 pounds per square inch of contact surface; at ultimate strength, for plain rods, 400; for rods with deformed surface, 600 pounds per square inch. A plain rod should be embedded 40 diameters to develop its tensile strength. Concrete grows in strength with age. With compressive strength at 28 days is unity; 7 days, 0.60; 28 days, 1.0; 60 days, 1.20; 3 months, 1.25; 4 months, 1.30; 6 months, 1.35; 1 year, 1.45; 3 years, 1.50.

The quantity of concrete is less than the sum of the fine and coarse aggregate, since the fine aggregate fills the voids in the coarse aggregate. Fullers' rule is: The number of barrels of Portland cement required for a cubic yard of concrete is the sum of the parts of the ingredients divided into 11. Let c equal number of parts of cement; s equal number of parts of sand; g equal number of parts of broken stone or gravel; P equal number of barrels of Portland cement to cubic yard of concrete. Then $P = \frac{11}{c+s+g}$. Then $P \times g \times \frac{3.8}{27} =$ number of cubic yards of sand required for one cubic yard of concrete; $P \times s \times \frac{3.8}{27} =$ number of cubic yards of stone or gravel required for one cubic yard of concrete. A barrel of Portland cement weighs 376 pounds. Here 3.8 is the number of cubic feet of loose sand per barrel of cement. For a proportion of 1:2:4 a cubic yard of concrete requires 1.57 barrels of cement; 0.44 cubic yards of sand; 0.88 cubic yards of stone.

Safe working stresses are (in per cent of compressive strength): For bearing on concrete, 33 per cent; for axial compression, piers and plain columns, 22.5 per cent; for compression in extreme fibre of beams, 32.5 per cent; for bond, plain bars, 4 per cent; deformed bars, 5 per cent. A tensile stress of 40 to 50 pounds per square inch, when shrinkage cracks are not likely, and the conditions are not critical, may be allowed. Coefficient of expansion and contraction of concrete with temperature for one degree Fahrenheit is 0.0000055 to 0.0000060. Expansion joints must be provided about every 30 feet in plain concrete. By use of steel expansion is reduced, and distributed with a number of fine cracks that do not seem to affect the structure. Concrete shrinks when hardened in air and swells when hardened in water. Sudden change in dimension of sections should be avoided, or fillets should be used.

Destructive Agencies.—In all cases concrete should be impervious to water. Steel embedded in good watertight concrete is preserved from corrosion above or below water level. Stray electric currents may cause corrosion of steel but the concrete is practically immune. Sea water, entering porous concrete, is likely to cause disintegration. Frost acting on water in porous concrete will cause spalling. Strong acids and organic acids and rapid crystallization of alkali salts under wet and dry conditions attack concrete. Mineral oils have no action.

Concrete has low heat conductivity, and is a good fireproofing material. Dehydration begins at 500° F. and is completed at 900° F; but is confined to outer surfaces of two to three inches, in conflagrations. The most severe conflagration of the Edison factories at West Orange, N. J., 9 Dec. 1914, in which temperatures of from 1000–2500° F. were developed, showed reinforced concrete buildings (in this case of defective design) to withstand such extreme fires satisfactorily; columns and beams suffered spalling; some failed; the cost of restoration was from 10 to 15 per cent.

Imperviousness of concrete to water is best ensured by a dense concrete mixed wet. Dry or porous concretes are rendered less pervious by various integral compounds or surface coatings; many of these are of temporary effect. Hydrated lime, in amount of 10 per cent of the cement, has been recommended.

Structures, such as retaining walls, bridge floors, subways, basements, are waterproofed by a membrane made up of one or more layers of fabric impregnated with asphalt, or coal tar pitch, cemented together with asphalt or coal tar pitch preparation. The fabric may be a wool felt, an asphalt felt or burlap. From two to six layers are used often. The membrane is protected from abrasion or other injuries by a covering of asphalt mastic or paving brick.

For damp-proofing, coal tar pitch, either dissolved in benzene or applied hot, is painted on like a paint. Surface of concrete must be dry. A coal tar paint when made up of one part kerosene, four parts Portland cement, 16 parts refined coal tar, is very effective and may be applied cold.

Cost of Waterproofing.— Cost of coal tar when applied in three coats is ½ cent for material and ½ cent for labor per square foot. Cost of membranes is from 20 to 45 cents per square foot, including protection. For surface work a mixture of concentrated lye and alum in proportions one pound lye to five pounds alum is used successfully by the United States army engineers. Paraffine applied hot is sometimes used. A wall may be impermeable, but not damp-proof, for the water may enter by capillary action into minute openings and eventually may render damp the air of a room where there is little circulation of air. The secret of success is dense concrete laid continuously.

Efflorescence.— The whitish or yellowish stains that occasionally appear on a concrete surface exposed to action of the weather are due to the leaching out of lime or other salts. The more waterproof the concrete the less probable these are. Unsightly appearances are also due to leakage through construction or shrinkage joints.

Surface Treatment.— Surface of concrete may be treated to improve its appearance by scrubbing off the film of mortar when green or tooling it when hard, to expose the aggregate, which may be selected for aesthetic effect. A wash of 10 per cent acid solution is also used. Plastering or stucco on concrete must be applied with care. (See STUCCO). For large and important structures, smooth forms and careful spading of dense concrete against these forms is preferable to any after effects. For ornamental work, best effects are produced by use of dry selected aggregate next to forms and by setting-in tiling. By the use of the cement gun fine aggregate and cement and water are blown by air pressure through a nozzle onto a surface to be covered.

Cost.— The cost of concrete depends upon cost of cement, sand and stone, upon conditions of work and size of work. Where forms are simple, cost ranges from $4 to $7 per yard.

Thin sections, with expensive forms and handling, will bring this up to from $10 to $20 per yard. A reliable estimate must take account of all of the circumstances.

Applications of Massive Concrete.— Massive concrete, or plain concrete not reinforced with steel, as used up to about 1850, is applied to foundations, walls, piers, dams, retaining walls, short arches, etc. In these uses, the principal stresses are compressive. No tension is expected on the concrete. For instance in a massive retaining wall, the resultant force of the lateral pressure of the earth on the wall, and the weight of the wall is directed outwardly downward and acts within the middle-third of the horizontal width of the wall. Consequently no bending action exists and no tension exists in the concrete on the interior face of the wall. Structures of massive concrete are the old stone masonry forms built in concrete.

With metal reinforcement to carry principal tensile stresses, concrete structures can become more constructed in cross-section, more skeletonized, and the members can withstand bending action.

The advantages of massive concrete over stone are availability of local materials; use of unskilled labor and machinery in mixing and placing; adaptability for placing in small spaces; monolithic character of resulting structure. The following elements need careful consideration: Cost of forms, expansion and contraction; uncertainty of quality of materials, demanding skilled inspection; appearance of surfaces; necessity of extra good foundations to prevent cracks due to settlement in an unyielding material.

Application of Plain Concrete.— Sidewalks usually are 4 to 5 inches thick on a foundation of porous material 10 inches thick. For a 4-inch walk, the base is a dry tamped concrete 3 to 3¼ inches thick, and laid in blocks about 6 feet long, or the width of the walk, separated by a joint, formed by tarred paper or sand. After a few of these blocks have been laid, and protected from dirt and dust, and before they have set, the wearing surface of mortar from ¾ to 1 inch is placed, is leveled with a straight edge and floated with a plasterer's trowel. The final floating is performed from two to five hours afterwards. Grooves are made in the wearing surface just above the joints in the base. Skill is necessary in properly floating the surface at the right time. The finished wall must be protected from the hot sun. Basement floors are constructed in the same manner except that a wetter concrete may be used for the base, and in cellars the joints omitted. Driveways are similar to sidewalks, and are from one inch thick for ordinary traffic up to five inches for heavy trucking.

Concrete roads are now established construction. Knowledge of the necessity of skilled contractors, very best materials, for difficult service conditions has been gained at expense of early failures. National conferences on concrete road building in 1914 and 1916 crystallized practice. The travel on rural and suburban roads has increased rapidly in recent years and changed in character to motor driven vehicles that destroy the surface of ordinary water bound roads; so that the maintenance of these throughout the entire year to meet the demands of modern conditions has become impracticable from an economic standpoint.

The selection of clean, hard, well-graded aggregates is of the utmost importance. Practice in supplying reinforcement to minimize cracks, or in inserting transverse joints, is not yet settled. The function of the small amount of reinforcement supplied is to keep together two portions of the concrete which have inevitably cracked due to settlement or shrinkage, and so prevent failure of the slab, rather than to prevent cracks. The latter remain small and soon fill up. Reinforcement is so formed of reticulated metal, as wire mesh, expanded metal, in amount about 28 pounds per 100 square feet of surface. Transverse joints ¼ inch thick spaced 36 feet apart are filled with fibre matrix or bitumen and are protected by metal plates which, however, may be omitted if the filler is of a character that runs out under traffic.

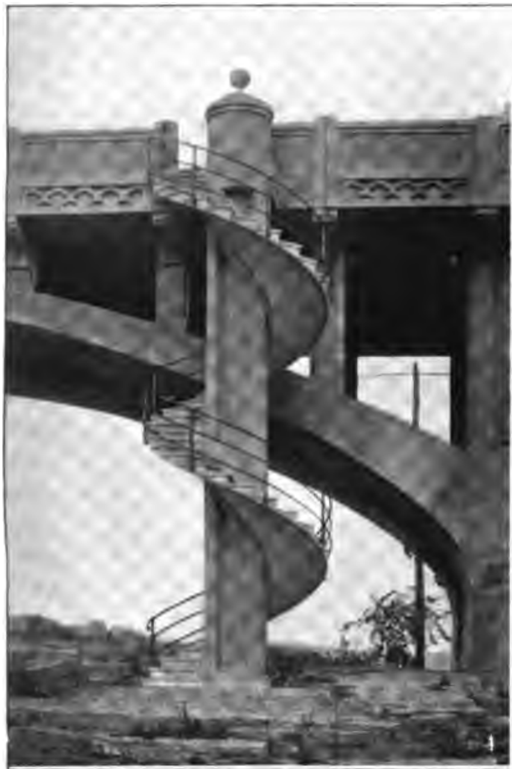
A single track road should be 10 feet wide, and a double track road 18 feet wide. On each side is a macadam or gravel strip for turning out, the total width of roadway is 20 and 26 feet, respectively. The thickness of the roadway slab is 6 inches at the edges and increases to 7 or 8 inches at the middle, depending upon loads and other circumstances. The slab is built either with a wearing surface on a concrete base as in sidewalks, or preferably as a one course slab floated on the surface. In 1914 there were 14,200,000 square yards built, equivalent to 1,500 miles of 15-foot roadway, and in 1915, some 15,000,000 square yards.

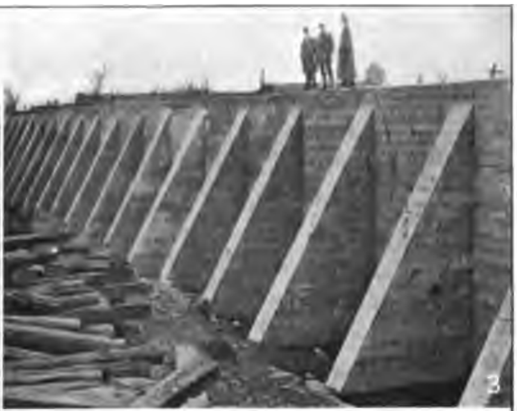
The cost of constructing concrete roads in 1915 in the United States, excluding grading, drainage or roadbed, varied from 98 cents to $1.28 per square yard, depending upon locality and other conditions. In 13 States out of 17 the cost was less than $1.12 a square yard, or $6,570 a mile for one mile of single track road 10 feet wide.

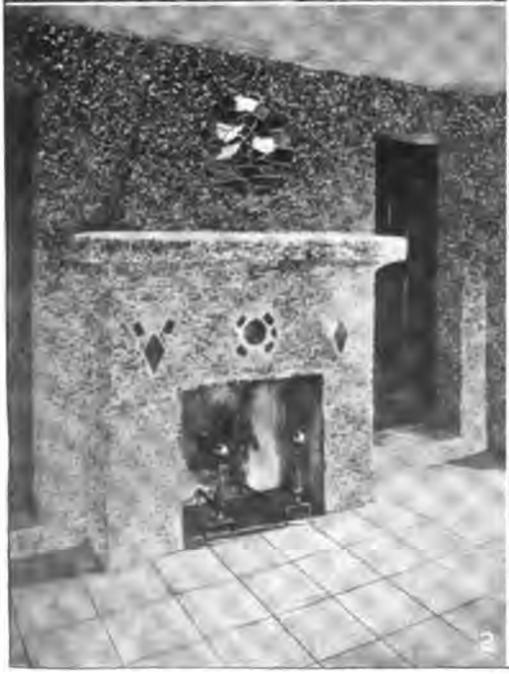
Maintenance of concrete roads is taken to mean, not the repair of obviously defective construction, resulting from careless workmanship and poor materials, but such work has been usually done in filling cracks or joints or small holes, with tar and sand. The cost per mile for such work in Ohio in 1914–15 was $29 per mile for 122 miles. Extensive data of cost of maintenance are lacking. It may be estimated that the maintenance cost just cited is not likely to be exceeded in pavements one to five years old.

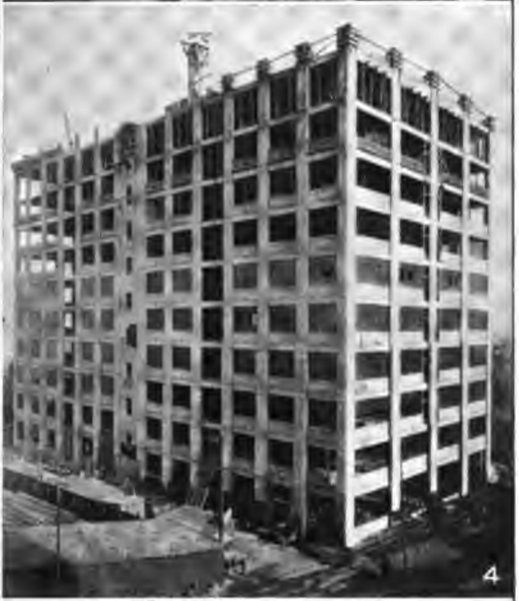
Concrete walls for foundations and cellars may be made 1:3:6. A 10-inch thick wall will stand when hardened a pressure of 6 feet of earth, and if supported laterally by joists may be 6 inches thick. Building walls are single, or double with an open space. A single wall 6 inches thick is equivalent to a 12-inch brick wall. Each face of a hollow wall is 3 or 4 inches thick, and the air space may vary in middle, 9 inches being a convenient size. Concrete should be wet to flow readily in the forms. Concrete building blocks with air spaces of various designs are machine made of rather dry or porous concrete. These are apt to be of inferior quality of concrete, and unsightly in place. With special machinery and aggregates a satisfactory wall can be secured. Plain concrete is used for retaining walls, piers, dams, in about the same sections as the stone

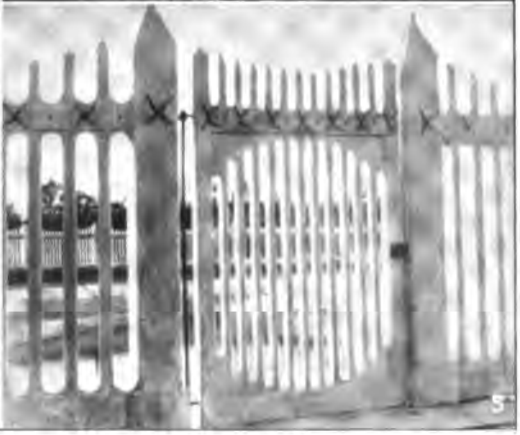
CONCRETE CONSTRUCTION











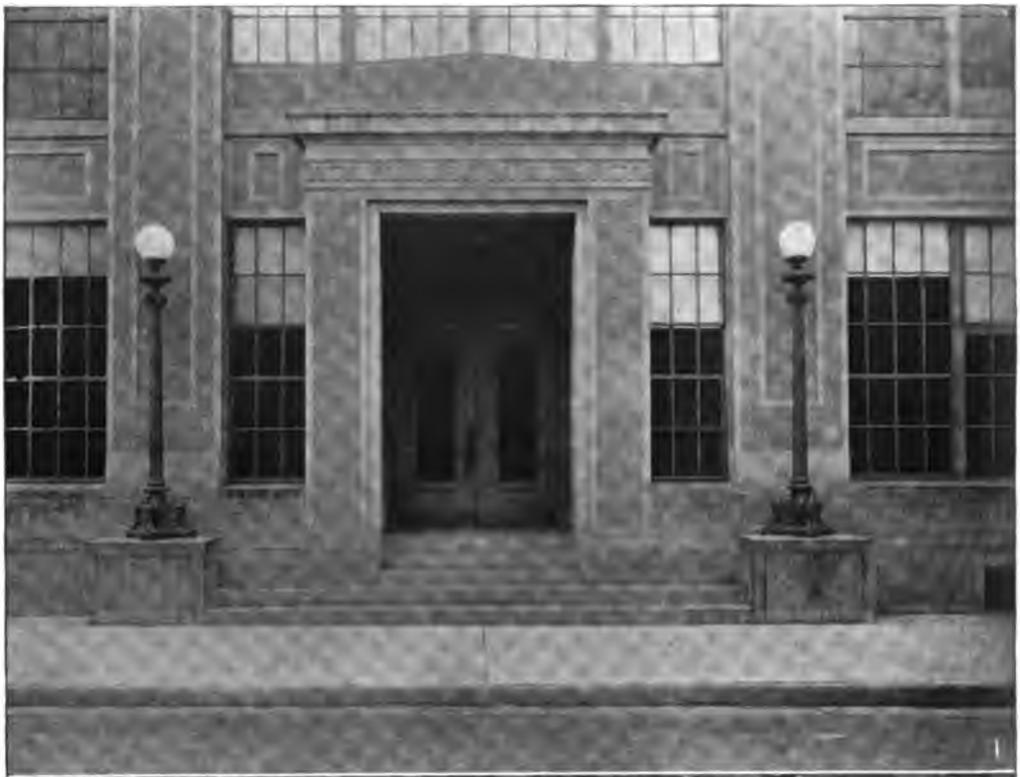
1 Glens Falls Bridge, Arch of Concrete, with Spiral Stairway

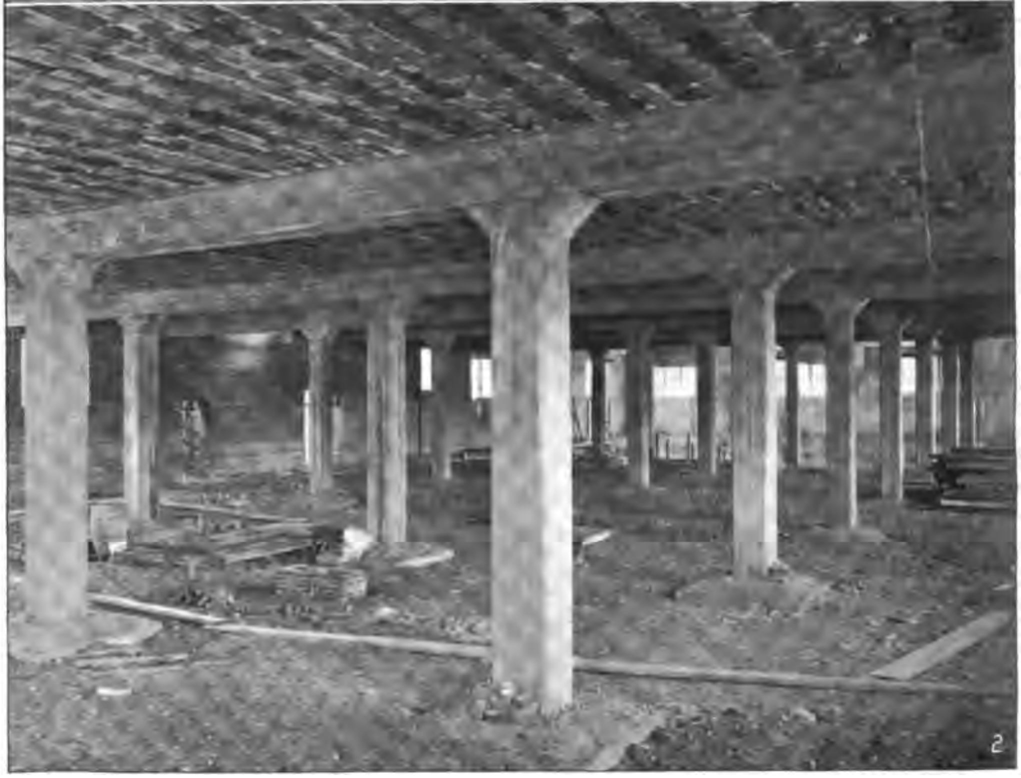
2 Fireplace of Concrete with Selected Aggregate and Inlaid Tiles

3 Back of Reinforced Concrete Counterfort Retaining Wall

4 Reinforced Concrete Building with Wall Girder and Columns

5 Concrete Fence





1 Concrete Building with Tooled Surface Finish

2 Reinforced Concrete Hollow Tile Rib Floor Construction

masonry it displaces. The sections of brick or stone arches may be reduced from 10 to 20 per cent. Some reinforcement in arches is always advisable. Reservoirs and tanks, chimneys, silos, etc., should be reinforced. Especial extension of uses of concrete on the farm is to be noted.

Reinforced Concrete.— Reinforced concrete is concrete with metal, usually steel embedded to assist in carrying tensile stress. Good concrete carries tensile stress in the earlier stages of loading up an extension corresponding to about 5,000 pounds per square inch in the steel, after which the steel does increasing duty. Computations for design omit this tension in the concrete. Steel is also used to assist in carrying compression in concrete in columns, arches and the compression flange of beams. Steel is also inserted in concrete to provide for shrinkage when setting and expansion and contraction under change of temperature and to minimize effects of settlement.

A simple beam of plain concrete breaks on the lower or tension face, when the strength of the concrete in compression on the upper face has reached only about 1/10th its capacity. When steel rods whose cross section equals about 1/100th of the cross section of the beam are introduced in the tension side, the beam becomes more nearly of equal strength in both faces of 1:2:4 concrete. Its capacity is very largely increased. The composite action of the steel and concrete depends upon the bond between the steel and concrete. The possibility of carrying tensile stress through the concrete by steel leads to great flexibility in design, and allows new forms and constricted sections. The advantage of such construction in difficult situations is marked. Reinforced concrete has thus replaced stone or brick masonry in many fields of construction, such as retaining walls, arches, foundations, and has opened up new fields in reservoirs, tanks, buildings, conduits, chimneys. The combination possesses in a large degree the advantages of both steel and concrete. Steel is protected from corrosion and fire, and is used in its most economic form. Expensive connections, use of skilled labor and scarcity of product in rush times are obviated. The artistic possibilities are apparent. As in plain concrete construction, the necessity of care in inspection of materials and building operations, the effect of freezing weather or of rapid drying, the dead weight on foundations and the problems of waterproofing need consideration.

Systems in reinforced concrete, such as the Monier, Hennibique, Kahn, Johnson, etc., are named after the inventor of a special arrangement of reinforcing to provide for the stresses, or for a specially formed bar, or unit assemblage of bars. These are described in special treatises. Patents in reinforced concrete are many, and the designer must have knowledge of some of them to anticipate payment of royalties. Recently there has been a tendency in the courts to invalidate patents that claim rights to particular arrangements of bars in reinforced concrete on the ground that only mechanical skill, and not inventive faculty, is required to place steel where tensile stress is to be met, or else to interpret the patent to narrow claims covering only the particular thing described in the patent.

Use of Steel.— Steel for reinforcing is in form of bars, usually round or square with ordinary surfaces (plain bars) or deformed surfaces, such as corrugations, lugs, bent fins. The endeavor is to design the bar so that the cross section may be equal throughout. Reticulated metal, such as expanded metal or woven mesh, is also used for short spans, and to resist volumetric change. Steel is usually of low carbon steel, especially when bars of greater diameter than one inch are to be used, but high carbon steel, both from billets and rerolled from steel rails, is extensively used. Usual thicknesses of steel rods are: for slabs ⅜-inch to ¾-inch; for beams ¾-inch to 1¼-inch; for girders up to 2½ inches.

The amount of steel in a beam depends upon the unit working stress for which the structure is designed. For stresses of 16,000 pounds per square inch in the steel, and 750 in the concrete in compression, a beam or slab is balanced *mechanically,* i.e., will have the assumed stresses, when 0.87 of 1 per cent of steel is present. This statement is based upon the conventional methods of design. In columns longitudinal steel is used up to 4 per cent and spiral steel from 1 to 2 per cent. In arches, 1 per cent of the cross-section at the crown both in the extrados and the intrados. Reinforcement for temperature is generally from 0.25 to 0.4 per cent of the cross-section which is subjected to temperature change.

Structural Forms in Reinforced Concrete. — Reinforced concrete construction is generally continuous and monolithic, all parts of the structure being tied together except for expansion joints. In this it is contrasted to wooden or steel construction where the parts act more as separate units. Concrete beams or girders are reinforced with about 0.9 per cent of steel at the lower side at the centre and an equal amount over the support when continuous. The latter amount is obtained by bending one-half of the bars up from the bottom around the quarter-point of the span, the remaining one-half coming from the other side of the support. The bars that are not bent continue horizontally to the support. Width of beams and girders is generally one-half to one-third the depth. The ends of beams and girders are strengthened against shear when necessary, by use of web reinforcement consisting of stirrups either vertically or inclined upward toward the support, rigidly attached to the horizontal bars and running to the top of the beam. The bent bars also provide this strengthening, which is necessary when the unit shearing stress (that is the load carried to the support divided by the cross-section of the beam above the horizontal steel), exceeds 40 pounds per square inch. In no case should this shear stress exceeds 120 pounds per square inch in strengthened beam. The size of beams depends upon loading. A moment of 1/12WL must be provided for in continuous beams. W = total load on beam and L = span from clear to clear plus ½ depth of beams. A non-continuous span must carry a moment of ⅛WL. This resisting moment is calculated by multiplying the area of the steel by the unit stress and by a leverage (about the compression centre) of approximately ⅞ the depth of the beam above the steel.

Slabs run between beams, and are designed upon the same principles as beams. Slabs have spans from 4 to 20 feet. For usual loads a span of 8 feet between beams is economical.

Columns may be reinforced by from 1 to 4 per cent, longitudinal rods well tied together by ¼ and ⅜ wire at distances not to exceed 16 times the diameter of the rod. There should be a minimum of 2 inches of concrete outside the rods. The concrete of the core, i.e., inside the steel, may be loaded to 500 pounds per square inch plus the amount carried by the steel. The unit stress on the latter is 15 times the unit stress on the concrete. Preferably columns should be reinforced with longitudinal rods and spirals, the latter to at least 1 per cent. In this case the core can carry safely 750 pounds per square inch plus the amount on the longitudinal steel for 1:2:4 concrete. In case of richer concrete an increased stress in proportion to the increased strength of the concrete may be used. Columns should not be too slender. Lengths of from 15 to 20 times the diameter are conservative. Practice in design is largely regulated by the Report of the Joint Committee on Concrete and Reinforced Concrete.

The first buildings of reinforced concrete were designed of slabs, beams and girders, similar to wooden construction. A modern type, the so-called flat-slab floor, dispenses with all beams and girders, and uses a continuous flat slab of equal thickness throughout, supported on columns with flared heads. At times the slab thickness is increased around the column head, a so-called «dropped panel.» The reinforcing consists of bands of small rods ⅜-inch to ½-inch diameter; in the 4-way system running diagonally between columns and also directly; in the 2-way system the rods run rectangularly at right angles to the sides of the panel and are spaced more closely near the column. The rods are bent up from the bottom of the slab to the top about the ¼ distance of the span to pass over the column in the 4-way, or over the column and the edge of the panel in the 2-way. Rods that are spliced should pass over to the third point of the adjoining panel. The flared head of the column should be 0.225 of the span between column centre, and the flare should be not more than 45 degrees with the vertical. The slab thickness should be not less than 1/32 the span length. The greatest bending moment exists around the column heads. These flat slab buildings offer more favorable installation of sprinkling systems, spread light farther in the interior, provide a given head room with less height of building and offer economy in forms and in construction. The General Electric Company's factory building at Fort Wayne, Ind., has a «Corr-plate» flat slab floor with panels 25 feet by 25 feet. The slab is 13 inches thick at the centre and 23 inches thick at the columns. The expanded head of the column is 60 inches in diameter. For a live load of 400 pounds per square foot, the two-way reinforcement of the panel consists of ⅝ corrugated bars spaced 10½ inches in the centre of the panel, then ¾-inch bars spaced 9¼ inches, decreasing to 6¼ inches spacing near the columns. The Soo Terminal at Chicago is an elevated railroad yard over 2,000 feet long and 345 feet wide carrying the heaviest engines. Columns 12 feet 10 inches high, spaced 24 feet square, are 32 inches in diameter, and flared out to a 5-foot 6-inch capital. The slab is 18 inches thick at centre and 30 inches thick for an area of 9 feet square, surrounding the columns. The reinforcement is 4-way, consisting of ¾-inch rods spaced 5½ inches. The structure is without expansion joints.

An excellent type of floor slab is composed of hollow tile spacers between reinforced concrete joists, giving a stiff, light flat ceiling that holds plaster well. Some buildings are constructed by erecting previously and separately molded elements such as columns, beams and slabs. Occasionally a light structural steel framework is erected and supports the forms. After the concrete is poured, the framework becomes the reinforcement.

Finish of concrete floors is similar to wearing surface in sidewalks. If a wood floor is desired, nailing strips of wood about 2 inches by 4 inches spaced 16 inches are laid on the rough slab and embedded in a lean cinder concrete. Linoleum may also be laid directly on a smooth base. Various special floor finishes have been devised.

Footings in uniform soils should be designed for equal soil pressure so that the settlement of the entire building shall be uniform to avoid cracks. The dead load is chiefly considered. In firm soils such as gravel, hard clay, footings may be plain, without reinforcement, sloping from the column base at an angle of 60 degrees with the horizontal. Column footings on yielding soil are spread, and designed as cantilevers to resist flexure. The load on the column plus the dead weight of the footings divided by the bearing capacity of the soil equals the required area of the footing. The rods may run in either 2-way at right angles, or 4-way, i.e. rectangular and diagonal. Often the footing for a wall column on a property line cannot project into the adjoining property; then a combined footing for the wall column and the adjoining interior column is constructed of trapezoidal shape to carry both columns. Raft foundations, consisting of a simple slab under the entire building, float the structure in yielding soil, or support it on piles.

Reinforced or plain concrete piles are either formed in place, as the Simplex and Raymond, or separately molded and driven, as the Gilbreth and Chenoweth. Unlike wooden piles, they may extend above the level of permanent ground water. In the Simplex pile, a hollow cylindrical steel tube or form 16 inches in diameter and ¾-inch thick is driven to a suitable bearing. Then the pile is filled with concrete and the tube withdrawn. The driving point may be either a conical cast-iron point, that is left in place, or more rarely, a hinged cutting edge, an «alligator point,» which opens as the tube is withdrawn. For the Raymond pile, a conical shell, made of wire encased in a thin sheet steel shell, is driven along with a mandrel, to refusal. The mandrel is withdrawn, and the shell filled with concrete. In these two types it should be certain that the soil does not fall back as the tube is withdrawn, or else deform the green concrete; and that the back pressure does not deform the shell. Apart from simple reinforced piles, patented forms of separately molded piles are the Gilbreth pile, a tapered reinforced pile with longitudinal corrugations, and a central hole for a water jet; and the Chenoweth pile, which is rolled. A layer of concrete, two inches or more in thickness, is laid on wire cloth, attached to a mandrel; after rolling the wire cloth becomes a spiral in the pile, which is also wrapped around with wire. Separately molded piles are made under favorable conditions as to concrete. (See PILES). In the McArthur construction a hole is driven to a firm stratum, and enlarged at the bottom by tamping concrete.

Walls of concrete buildings are preferably of skeleton construction, with wall girders and columns, and curtain walls of concrete 6 inches thick, or of brick or tile. The surface is often veneered with brick, tile, marble, etc., which is tied on with metal ties, previously fixed in the concrete.

Stairs of concrete are reinforced as beams between floor and landings. For common spacings of about 6 feet from floor to landing, the steps are 5 inches thick from the re-entrant angle of tread to bottom, with ½-inch round rods 6-inch centres; at each floor is a girder about 10 inches by 15 inches deep and the landing is a simple reinforced slab 5 inches thick, when the stairs are parallel; if at right angles, the landing is hung by rods to a girder above the stairway.

Windows of wire glass in metal frames, sliding or pivoted either horizontally or vertically, are a part of the complete equipment of a modern reinforced concrete building.

Partitions are of concrete 3 or 4 inches thick, slightly reinforced against shrinkage cracks; but metal lath and plaster terra cotta tile, or plaster lath partitions are more common. Metal lath and plaster partitions 4 inches to 6 inches thick have a framework of steel studding running between floors, upon which is fastened the metal lath, which is then plastered with a mixture of lime and cement mortar in three coats; the first and scratch coat with hair or fibre. The hollow space may be filled with cinder concrete. Metal lath of various commercial forms with integral projecting ribs need no separate studding. Plaster blocks made chiefly of gypsum, or plaster of paris, with an admixtured fibre are easy to handle and cut, but are not as fireproof as other forms.

Considerable ingenuity is shown in devising forms of light concrete beams, factory made, for floor systems of dwellings.

Floor Loadings.—Concrete will spread heavy loads, on small areas, to adjoining portions not so heavily loaded and thus permits of partial overloads. Such floors are often loaded to as much as twice the design load, and therefore there should be conservative designs to begin with. As a test of workmanship it is common practice to load a simple panel or two adjoining panels with a test load equal to twice the design load plus once the dead load. Floor live loads per square foot to be provided for are (Boston practice): dwellings and apartment-houses and public hotels, 50 pounds; office floors, and for public rooms of apartment and public hotels, 100 pounds; floors of retail stores and public buildings, except schoolhouses, 125 pounds; schoolhouses, other than floors of assembly rooms, 80 pounds and for floors of assembly rooms, 125 pounds; drill rooms, dance halls and riding schools, 200 pounds; warehouses and mercantile buildings, at least 250 pounds. Concrete floors are designed up to 1,000 pounds per square foot. Ordinarily the increase in loads to allow for impact is small in concrete structures, from 20 to 50 per cent of the live load in bridge floors, and none in arch rings or heavy members.

Reinforced concrete retaining walls appeared early in the art before 1894. In the L type the vertical stem which holds the transversely-acting earth pressure is a cantilever. There is also a cantilever transversely acting horizontal base, projecting back, acting upon which the weight of earth equilibrates the lateral pressure. This type is used up to heights of about 18 feet. Reinforcement runs vertically down the face of the vertical stem next to the earth, and is anchored in the base. Horizontal rods run on the upper side of the base (the heel) and are anchored in the vertical stem. The horizontal base may project in front of the wall to form a cantilever toe with rods in the bottom. Reinforcement in the exterior outward face of the vertical stem provides for shrinkage and expansion. Expansion joints may be provided. In excess of heights of about 18 feet, the counterfort type is used, in which the vertical stem and horizontal base are connected on the inside by counterfort walls. The vertical and horizontal elements now become slabs carrying earth pressure and weight to the counterforts which are designed as vertical cantilevers, and to which the slabs are well tied. Types of plain and reinforced concrete retaining walls merge into one other.

Abutments for bridges are similarly designed. Cellular construction in abutments and similar construction in reinforcement concrete is a logical development, by which thin sections, properly reinforced, replace heavy masses.

Reinforced concrete dams have a sloping water tight reinforced concrete deck or slab supported on vertical concrete walls. The water pressure increases, instead of opposes, stability. The sloping deck may continue to rise over a crest and fall to an overfall slab sloping down stream. The two slabs are connected by vertical walls or buttresses. The deck slab is designed to carry the water pressure to the vertical walls. The Schuylerville, N. Y., dam is 250 feet long and 25 feet high. Vertical walls, 10 foot centres, 12 inches thick, support a deck tapering from 8 inches to 12 inches thick, while the overfall apron is 8 inches thick. A foot bridge passes under the dam, supported on the vertical walls. Such dams are commonly known as Ambursen dams.

Open concrete reservoir walls are designed upon similar principles to those applied to retaining walls. Expansion joints and watertightness are important. They are lined with a concrete bottom 4 inches to 8 inches thick, preferably reinforced with a mesh of metal.

Covered reservoirs have concrete bottoms carrying the upward pressure to columns that also support the concrete roof. Roof and bottom may be groined arches or slabs. Reservoirs of groined arches in the United States have spans from 10½ feet to 16 feet, a rise of from 1 foot 6 inches to 4 feet, and a crown thickness of 6 inches. Since the exterior walls are supported by the roof, thinner sections are needed than for open reservoirs. A circular reservoir wall supporting a domed roof needs a ring of reinforcing at the top.

Reinforced concrete water tanks must be

constructed of impervious concrete, and are generally built in one operation of wet concrete. They should be reinforced, not only for mechanical stress, but for shrinkage. The tank of the filtration plant at Merrimack, N. H., is 40 feet high, and 14½ feet in diameter. The walls are 10 inches thick at the top. Rings of deformed round bars ⅞-inch in dimension, are spaced 6 inches vertically in centre of wall, intersected with ⅞-inch vertical rods, spaced 5 feet centres.

Examples of reinforced concrete stadia and grandstands are found at Harvard, Tacoma, Syracuse, Yale. These offer a suitable appearance, require no repairs and prevent accidents that arise from lack of maintenance of wooden structures. The following statistics show seating capacity of well-known stadia:

Stadia, Circus Maximus, Rome, estimated 380,000; Colosseum, Rome, estimated 45,000 to 100,000; Yale Bowl, 125,000; Athens Stadium, 50,000; College of City of New York, 10,000; Syracuse, 20,000; Tacoma, 20,000; Harvard, 45,000; Princeton, 41,500. Construction cost per seat ranges from $36 for the stadium of the City of New York, $8.50 for the Princeton Stadium to $7.35 for the Yale Bowl.

Grain and ore bins, coal pockets are other containers that are common.

Bibliography.— Hool, 'Reinforced Concrete Construction' (New York 1912); Mörsch, 'Concrete Steel Construction' (*Engineering News,* New York 1910); Sabin, L. C., 'Cement and Concrete' (New York 1907); Taylor and Thompson, 'Concrete: Plain and Reinforced' (New York 1908); Turneaure and Maurer, 'Principles of Reinforced Concrete Construction' (New York 1909).

W. K. Hatt,
Professor of Civil Engineering, Purdue University.

CONCRETE MACHINE MIXERS. Machine mixers used in the United States may be grouped into three classes: (1) continuous; (2) batch and (3) gravity mixers. The continuous mixer usually consists of a central shaft, to which are attached arms or paddles, rotating in a long trough. The paddles are set at such an angle that they have an endless screw action, cutting and pushing the materials down toward the lower end of the trough, out of which a continuous stream of concrete flows. Two types of machines are used — one in which the materials are thrown into the trough by men standing at the sides of the machine, part shoveling sand and part stone, another in which the materials are placed in hoppers at the head of the trough and measured automatically. Batch mixers are divided into cube mixers, the double cone or Smith mixer and the Ransome or drum mixer. In operation the batch mixer is turned 10 or 15 times or more after charging and then the materials are discharged. In the gravity type the falling materials strike baffle plates, which throw them together in their descent through the machine. The materials are measured in layers on a platform above the machine, and then shoveled into it.

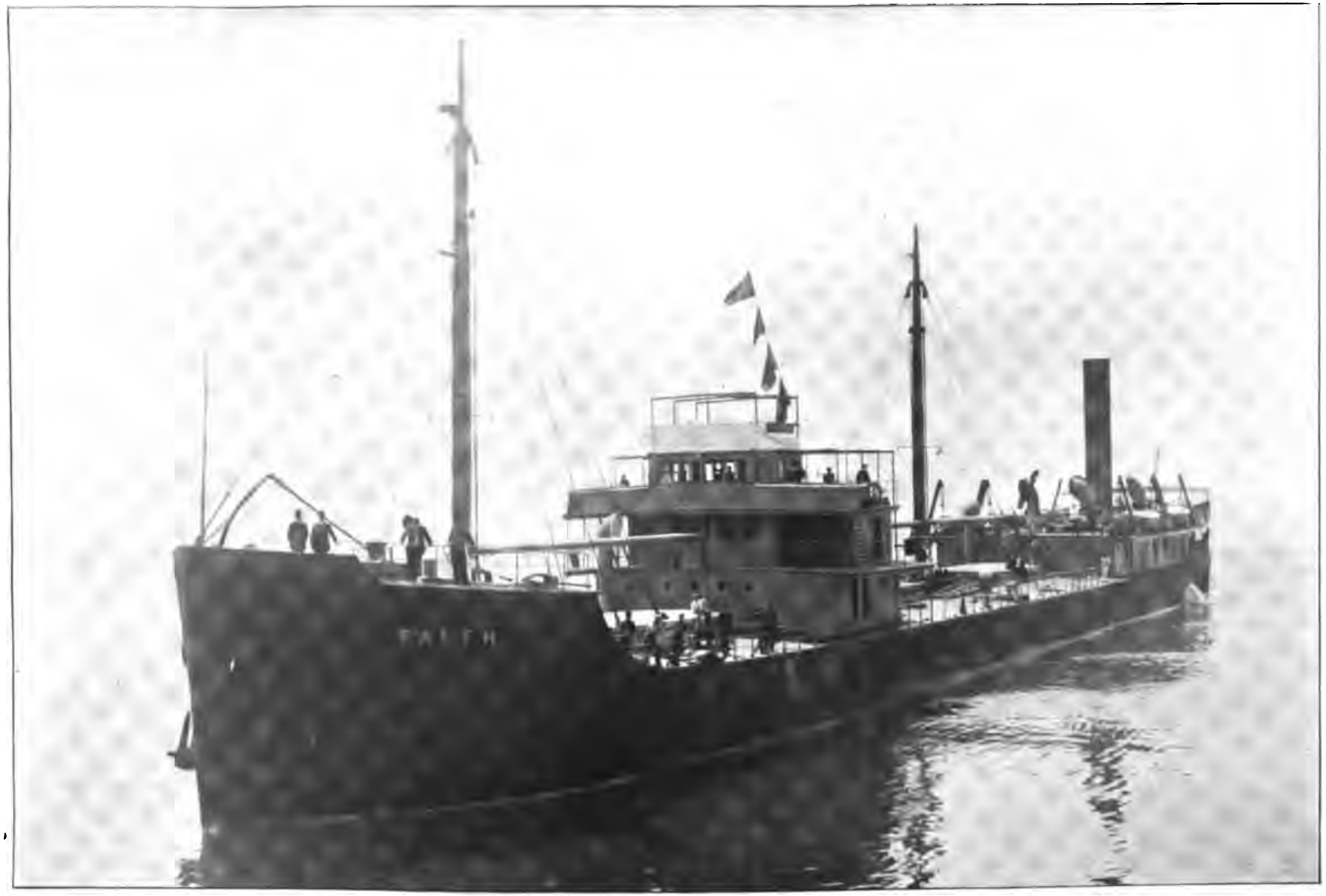
CONCRETE SHIPS. For vessels of moderate size, reinforced concrete has taken its place as a real shipbuilding material. It possesses obvious advantages for the building of many useful types of craft. Among its recommendations are simplicity and rapidity of construction, the readiness with which repairs can be executed, high resistance to strain and shock, incombustibility and fire-resistance, relatively low cost and the virtual elimination of maintenance charges. Experience appears to show that the skin-resistance of a reinforced concrete vessel to passage through water is slight, owing to the smoothness of the surface and the absence of joints, and the ease with which scraping can be effected.

Reinforced concrete lends itself to the most modern developments in shipbuilding design, and although the skin of the hull must necessarily be thicker than when steel plates are used, it need scarcely be thicker than would be the case if timber were employed. Assuming three inches to be the thickness adopted, the weight per square foot would be less than that of steel one inch thick. Therefore the question of dead-weight does not appear to constitute a very serious objection, especially in view of the fact that the weight of the hull of a vessel is small in comparison with the weight of equipment, fittings and cargo.

After America's entry into the war in April 1917, the pressing need for ships and the existing congestion in American shipyards led marine engineers to consider the possibility of utilizing other materials than wood and steel for shipbuilding. The most promising alternative was found to be reinforced concrete. Its application to the construction of ships was at once studied intently by prominent engineers of Britain and America. Fortunately valuable pioneer work in this field had been proceeding successfully for a decade or more and showed the way along which successful development was possible.

History.— The first example of what we know as reinforced concrete was a rowboat built in 1849 by M. Lambot, of Carces, France. The process of construction was patented and M. Lambot exhibited his work at the Paris Exposition of 1855. The French government investigated the work of M. Lambot in 1850, but, as usual, further development was left to private initiative. In 1899, Carlo Gabellini, of Rome, Italy, began the construction of concrete scows and barges. His process had been so developed by 1905 that a 150-ton barge was constructed for the city of Civita Vecchia. The following year another barge was built for the military harbor at Spezzia, for the use of the Italian navy. This latter barge before acceptance was put to the severe test of being driven against some piling and afterward being rammed by a steel towboat. Results of these tests were so satisfactory that construction of similar boats and barges followed.

Methods of Construction.— In the Gabellini method the first step in «laying down» these vessels consists of placing reinforcement for the keel and ribs. This reinforcement, which usually consists of round steel rods, is then covered on the outside with ¼-inch wire mesh, to which a 1-inch coat of cement mortar is applied by hand. Next a somewhat thinner coat of mortar is placed on the inside, following which forms for the ribs and keel are put in place and concrete deposited for these parts of the vessel. These ribs run both longitudinally and transversely so that a checkerboard arrangement results, the pockets being 10 inches deep and the ribs about 2 inches wide. Over



CONCRETE CARGO STEAMSHIP "FAITH" ARRIVING IN SEATTLE AFTER HER MAIDEN VOYAGE FROM SAN FRANCISCO

The "Faith" is the first and the largest concrete ship built in America

these ribs ⅛-inch wire mesh is placed with a thin mortar covering plastered on. Finally a third and coarser wire mesh is pressed into the soft mortar and the entire surface troweled over. This completes the hull. Bulkheads are next concreted and the boat finished with a wooden sheer strake and gunwale.

The first concrete boat in Holland was built in 1887 by the Fabrieck van Cementljzer Werken. This firm first built barges up to 11 tons capacity, which proved so successful that plans were elaborated resulting in the building of barges 64 feet long and 14 feet beam, of 55 tons capacity. Briefly, the system of construction consisted of building longitudinal and transverse bulkheads spaced approximately on 6-foot centres, thus providing a cellular construction, which made the ship practically unsinkable. German shipbuilders, in 1909, at Frankfort-on-the-Main, constructed a concrete freighter of 220 tons. Simple forms were set up and concrete placed between them. A concrete sailboat was built in 1912 by Johannes Lescher of Dresden. It embodied the latest principles of sailing vessel construction as to shape of hull, etc. In 1914 the Sydney Harbor Trust had constructed a pontoon of reinforced concrete for use in Sydney Harbor, N. S. W. It is 110 feet long, 53 feet 3 inches wide at the bow, 67 feet 7 inches at the stern, has a draft of 7 feet 9 inches and deck area of 6,000 square feet. The total displacement is 783 tons. Concrete barges have been in use for some years on the Manchester Ship Canal, and one on the Welland Canal has successfully withstood very severe tests since its installation in 1910. Concrete barges built on the Panama Canal in 1911 proved good examples of what service such barges could render under adverse conditions. In this case concrete was selected as the construction material because no skilled labor for steel or wood ship construction was available, nor could steel plates nor suitable seasoned timber be obtained within the time required. Concreting materials were at hand in large quantity and the expediency of using concrete suggested itself as a happy solution of the problem. Concrete barges have been constructed also and placed in successful operation at Baltimore, Md., and Mobile, Ala.

In 1917 a concrete lighter was built at Porsgrund, Norway, and its success led to the construction of larger ships at the same plant. In the same year a 300-ton concrete motorship was built in England for coastwise and channel traffic. At the end of the first half of 1917, 20 or more barges and ships of similar type were in use on the Paris ship canal. Canada came forward in the same year with a concrete ship proposed for lake traffic. A concrete ship approximating 5,000 tons was built for trans-Pacific service at Redwood City, Cal., in 1917, and a New York company in the same year built a 700-ton concrete barge, and in 1918 had contracts in hand and work progressing on a number of similar vessels. Norway came to the forefront in this field in 1917 in the numbers of concrete barges, lighters and ships varying from 200 tons up to 3,000 tons, launched. Some of these are in ocean traffic between Norway and England. The year 1918 saw rapid advances in the construction of concrete ships, due to the great necessity of overcoming the losses in merchant tonnage through Germany's submarine warfare. This development has been chronicled in the daily press and in the periodicals of the nation. Consult 'Concrete Ships' (issued by the Portland Cement Association, Chicago 1918), from which the foregoing account has been compiled; *Concrete and Constructional Engineering* (Vols. XI, XII, XIII, London 1916–18); *Marine Review* (Cleveland, August 1917); *Scientific American* (28 July 1917; 17 Nov. 1917); *Shipping Illustrated* (New York, 23 June 1914; 18 Aug. 1917; 29 Sept. 1917; 20 Oct. 1917); *The London Times* (Engineering Supplement, 25 May 1917).

CONCRETION (the act of growing together), the act of becoming united into one mass. (1) *In a restricted sense* the term is used to signify a solid mass, a clot or a lump formed by a process of growing together, as in animal economy, the hard substances that occasionally make their appearance in different parts of the body, as well in the solids as in those cavities destined to contain fluids; in the former case they are denominated concretions or ossifications; in the latter, calculi. The concretions are named from the parts of the body in which they occur. Pineal concretions, from their being found in that part of the brain called the pineal gland, consist of carbonate and phosphate of calcium with organic matter; salivary concretions, as being discovered occasionally in the salivary glands, also consist mainly of earthy phosphates; pancreatic concretions are hard substances found in the pancreas; pulmonary concretions, which have been sometimes coughed up by consumptive persons, contain mucus and albumen in addition to the salts; hepatic concretions, of which the liver is sometimes full, are composed chiefly of cholesterin, mucus and coloring matter; urinary concretions are found in the bladder, and their constituents are very variable, uric acid, urates, fibrin, oxalates, phosphates and several other bodies being found. Gouty concretions consist of urate of sodium and small quantities of other salts with organic matter. Concretions have been discovered in the intestines and stomach of man, but more frequently in the bodies of other animals. Those found in the intestines of a horse were examined by Fourcroy, and found to consist of magnesia, phosphoric acid, ammonia, water and animal matter. (See CALCULUS). (2) *In geology* concretion signifies an aggregation of mineral matter, in concentric layers and cast in a spherical form which is frequently flattened. (3) *In logic* concretion is the act of rendering a concept more determinate or concrete.

CONCRETIONS, masses of mineral matter, sometimes arranged in concentric layers, sometimes with a radiating structure, sometimes almost structureless, which have been built up particle by particle by circulating waters within the mass of another rock. Most concretions are circular or nearly so, but sometimes they occur in irregular shapes. Concretions of flint are common in limestone, and concretionary masses of iron pyrites frequently occur in coal. They vary greatly in size ranging from a fraction of an inch to several feet.

CONCUBINAGE, the act or practice of cohabiting without a legal marriage; the state of being a concubine; a natural marriage as distinguished from a legal marriage. Among the Greeks concubinage was allowed even to married men: the number of their concubines, also, was unlimited. Among the Romans concubinage was neither unlawful nor disgraceful. It was, moreover, formally permitted to unmarried men by the Lex Julia, and by the Lex Papia Poppæa, but with the provision that it should be limited to a single concubine, and that only women of mean descent, as freed women, actresses and the like, should be chosen for the purpose. The children begotten in concubinage were not considered as legitimate, but were called natural, and the right of inheritance of the concubine and her children was very much limited. With the introduction of Christianity concubinage ceased; and, indeed, Constantine the Great made laws intended to put a stop to it. Concubinage also signifies a marriage with a woman of inferior condition, to whom the husband does not convey his rank. By French law the presence of a concubine in the house entitles the wife to a divorce. See Marriage.

CONCURRENT JURISDICTION, the jurisdiction of different courts authorized to take cognizance of the same case. In criminal cases the court which first takes up a case has what is called the right of prevention, that is, the right of deciding upon that case exclusive of the other courts, which but for that right would have been equally entitled to take cognizance of it. In civil cases it lies with the suitor to bring his cause before any court he pleases, which is competent to take it up. Concurrent, also called cumulative, jurisdiction is opposed to privative jurisdiction. Where concurrent jurisdiction exists in the United States courts a decision of a State court may be taken up to the Supreme Court for review.

CONCUSSION OF THE BRAIN, a term applied to certain injuries of the brain resulting from blows and falls, though unattended with fracture of the skull. Stupor or insensibility, sickness, impeded respiration and irregular pulse are the first symptoms, and though these may subside there is always for a time more or less risk of serious inflammation of the brain setting in. Although all the conditions attending concussion of the brain have been carefully studied experimentally yet authorities disagree as to the causes which induce it. These causes have been variously stated as laceration of minute blood vessels, molecular changes in the brain cells or changes in the cerebrospinal fluid. The patient should be put to bed at once with the head low, and kept warm; but stimulants should, except in special cases, be withheld. All excitement should be avoided, and for some time after apparent recovery great care is necessary.

CONDÉ, kôṅ-dā, the name of a French family, the younger branch of the Bourbons, who took their name from the town of Condé, department of Nord. One Godfrey de Condé, about 1200, was in possession of a part of the barony of Condé. His great-granddaughter, Jeanne de Condé, married, in 1335, Jacques de Bourbon, Comte de la Marche, and the barony of Condé went to their second son, Louis de Bourbon, Comte de Vendôme, whose great-grandson, Louis de Bourbon, Prince of Condé, in virtue of his blood-relationship to the royal family, assumed the title of Prince, and is regarded as the founder of the new house of this name.

CONDÉ, Henri (ŏṅ-rē) **II de Bourbon,** Prince de: b. 1588; d. 1646. At the request of Henry IV he became a Catholic. In 1616 he was sent to the Bastile, where he remained for three years. After the death of Louis XIII the prince was liberated, and was made Minister of State to the regent.

CONDÉ, Louis (loo-ē) **I de Bourbon,** boor bôṅ, Prince de, French general: b. Vendôme, 7 May 1530; d. 15 May 1569. He married the grandniece of the Constable de Montmorenci. He served his early campaigns in Piedmont, but first distinguished himself at the defense of Metz, besieged by Charles V in 1552. Affronted at court, and hated by the Guises, he joined his brother, the king of Navarre, at Nérac, and joined the Huguenots in 1559. In 1560 he took part in the Amboise conspiracy to overthrow the Guises. He was arrested and sentenced to death, but was discharged after the death of Francis I and was made governor of Picardy through the influence of Catherine de Medici (q.v.) who was then all powerful in France. He soon after appeared as head of the Protestants, and was defeated and captured at the battle of Dreux, 1562. After being over a year in prison he was liberated, and for four years he kept the peace but fresh persecution of the Huguenots called him to arms again. In 1567 he fought the battle of Saint Denis without decisive result. Two years later the Protestants were defeated, and Condé was taken prisoner, badly wounded, at the battle of Jarnac, 13 March 1569. He was almost immediately assassinated by Captain Montesquieu, a Swiss soldier who was probably acting under orders from the Duke of Anjou. See Coligny, Gaspard de.

CONDÉ, Louis II de Bourbon, Prince of, French general: b. Paris, 8 Sept. 1621; d. near Fontainebleau, 11 Dec. 1686. He was the son of Henri II, Prince de Condé (q.v.) and during the life of his father bore the title of Duc d'Enghien. He immortalized this name at the battle of Rocroi, in which, at the age of 22, he defeated the Spaniards (1643). The same year he was sent to Alsace to help Turenne. Wherever he appeared he was victorious. He besieged Dunkirk in sight of the Spanish army, and gained this place for France in 1646. The death of his father in this year made him head of the Condé family with all its vast wealth and extensive estates; so that there were in the kingdom only the king himself and the Duke of Orleans who were more important personages than he. He was given command of the army in the Netherlands and appointed captain-general of the French forces. A great victory at Leas in 1648 won him a wonderful reputation. During the troubles of the Fronde he at first took the side of the court against the Parliament and the nobles, and after a siege of a few months brought back the young Louis XIV to Paris (1649); but believing himself ill requited by Mazarin for his services he put himself at the head of the faction of the *Petits Maîtres*. Being captured, however, he was imprisoned by Mazarin (1650), and was not released till after the lapse of a year. He at once put himself at the head of a new Fronde, and entered upon negotiations with Spain. In spite of several checks he then marched upon Paris, where he was met and opposed in the suburb Saint Antoine (1652). The battle which ensued was indecisive; and Condé, finding himself abandoned by many of his friends, retired to the Netherlands, and joined the Spaniards, who appointed him generalissimo of the Spanish armies. In 1658 he was defeated before Dunkirk, by Turenne, and was only restored to royal favor by the Peace of the Pyrenees in 1659. In 1668 he was charged with the reduction of Franche Comté (then belonging to Spain), which he accomplished in three weeks; and in 1674, at the head of an army sent by Louis XIV against the United Provinces, defeated the Prince of Orange (afterward William III of England) at Senef. He was unable, however, to take advantage of this victory, as he was obliged to withdraw into Alsace to defend it against Montecuculi, to whom it was thrown open by the death of Turenne in 1675. He succeeded in driving Montecuculi across the Rhine. This was his last triumph. Four years later he retired to Chantilly, near Paris, where he devoted himself to the sciences.

CONDE, Louis Joseph de Bourbon, PRINCE OF: b. Chantilly, 9 Aug. 1736; d. Paris, 13 May 1818. In the Seven Years' War he distinguished himself by his courage and skill, and at the outbreak of the Revolution he sided with the monarchy and afterward formed in 1792, at Worms, a little corps of emigrant nobility, which joined the Austrian army under Wurmser. In 1795 he entered with his corps into the English service. In 1797 he entered the Russian service, but in 1800, after the separation of Russia from the coalition, reentered the English service. The campaign of 1800 ended the military career of the prince. He returned to Paris in 1814; where, being appointed president of a bureau of the Chamber of Peers, he remained some time, but at last retired to Chantilly. He published 'Essai sur la Vie du Grand Condé, par L. J. de Bourbon, son 4me Descendant' (1806).

CONDELL, kŭn'dĕl, **Henry,** English actor: d. Fulham, England, December 1627. With John Heming he edited the famous first edition of Shakespeare's plays, 1623. He belonged, as did Shakespeare, to the lord chamberlain's company of players and is named in Shakespeare's will.

CONDENSATION, the reduction of anything to another and denser form, as of a vapor or gas to a liquid, or a liquid to a solid; the passage of gases or vapors from the aëriform to the liquid state. It is sometimes called also the liquefaction of vapors. It may be due to one of three causes: cooling, compression or chemical affinity. Before the first or second of these causes can operate, the vapor must be saturated. Various salts also condense vapors by means of chemical affinity. When vapors are condensed their latent heat becomes free. The condensation of liquids is the reduction of a liquid to smaller bulk, with a proportionate increase in the specific gravity.

CONDENSED MILK as generally manufactured and sold fresh daily for delivery to consumers is pure cow's milk reduced in volume by the evaporation of water in vacuum. No other constituent part of the milk is removed. This article is not put up in hermetically sealed cans nor intended for long-distance shipments.

Sweetened condensed milk is the product resulting from the evaporation of a considerable portion of water from milk to which sugar (sucrose) has been added for the purpose of preservation. It contains not less than 28 per cent of milk solids and not less than 8 per cent of milk fat.

Sweetened condensed skimmed milk is the product resulting from the evaporation of a considerable portion of the water from milk from which the greater part of the milk fat has been removed and to which sugar (sucrose) has been added for the purpose of preservation. It contains not less than 28 per cent of milk solids.

Evaporated milk is the product resulting from the evaporation of a considerable portion of the water from milk and contains not less than 25.5 per cent of milk solids and not less than 7.8 per cent of milk fat.

Evaporated skimmed milk is the product resulting from the evaporation of a considerable portion of the water from milk from which the greater part of the milk fat has been removed. It contains not less than 22.5 per cent of milk solids.

Early Experiments.— The first application of a practical process for condensing milk was made by Gail Borden, who was born in Norwich, N. Y., in 1801, and at the time of his experiments a resident of New York, through his adaptation of the vacuum evaporating process on original lines. Most of the earlier experiments of previous investigators were what might be called «open process.» The earliest known patents for reducing the volume of milk or attempting to preserve it are the following:

Newton, 1835.— For evaporating in "any known mode" alludes to the vacuum pan as affording a good method of introducing warm air through the milk.

De Lignac, 1847.— Evaporating in large, flat, shallow pans, heated by steam bath to 186° F., product put in tins, sealed and again heated to 210° F.

Grimwade, 1847.— Preserving milk by "the mixing of saltpetre with the milk, and then exposing it to heat in vacuo, so as to evaporate and extract the aqueous particles thereof" and then enclosing "in bottles from which the air has been previously exhausted." Never put in practice.

Louis, 1848.— Evaporating in shallow pans, with steam jackets, etc.

Grimwade, 1855.— Carbonate of soda or potash is first added and the milk then evaporated in pans with agitation until a doughlike substance is obtained, sugar is then added, and the mass pressed by rollers into ribbons, further dried and then pulverized. Practised for some years.

Cook, 1855.— Evaporating in steam evaporating pans.

Borden, 1856.— In vacuo, put into successful practice and has superseded all others.

House, 1857.— Substantially like De Lignac's, except evaporating at lower temperature.

Gail Borden's experiments began shortly after 1851 and his first application for a United States patent was made in 1853 which was at first rejected on the ground that it lacked novelty and usefulness. The patent, however (No. 15,553), was granted 19 Aug. 1856, on the following claim:

> Producing concentrated sweet milk by evaporation in vacuo, substantially as set forth, the same having no sugar or other foreign matter mixed with it.

This was followed by other patents: No. 1,306 dated 13 May 1862; No. 1,389 dated 10 Feb. 1863; No. 2,103 dated 14 Nov. 1865; No. 2,226 dated 17 April 1866.

Every feature of Borden's various claims as well as the state of the art was carefully and thoroughly investigated by the patent office examiners.

Necessary Sanitary Regulations.— Experience covering a period of over half a century establishes the fact that the sanitary precautions surrounding the manufacture of condensed milk, evaporated milk, etc., are the most stringent, and necessarily so, because the safety of the business depends upon thoroughness. Not only are the cattle inspected by competent veterinaries, but rules and regulations of the strictest kind provide for the cleanliness of these cattle, proper feeding of wholesome, nonfermenting foods, cleanliness of stables, the isolation of the milk room, cooling facilities, in fact every well-tested plan that facilitates the production of pure rich milk handled in the most cleanly manner. While seemingly these rigid requirements involve some extra expense on the part of the dairyman, he is more than compensated by having a steady, firm market for his product at better prices than he can get anywhere else. The consumer is benefited by obtaining a pure and uncontaminated product at a most reasonable price. There are of course, concerns in the business whose facilities and experience do not enable them to perform all of this work as thoroughly as those concerns, which have been established for many years.

The receiving platform is an interesting sight, for as the farmers deliver their cans of milk, each is examined by a trained inspector and tested. If it is not found to be up to the standard of the company, it is rejected. From the receiving room, the milk is drawn into what is called the "well room" where preliminary heating is effected in specially designed heating wells. If sweetened condensed milk is to be made, the necessary amount of sugar is dissolved in the milk at this point. The mixture is then drawn to the vacuum pan where the condensing process takes place in accordance with formula as to temperature, vacuum, etc., as found by the manufacturers to be best qualified for making the highest grades. The concentration is continued until the density indicates the milk to be of the desired composition. It is then drawn from the vacuum pan and cooled to the proper temperature for canning, before being conveyed to the sealing room. In the case of sweetened condensed milk, the product is supplied to the filling machines which automatically deliver the exact quantity desired into the cans. These are in turn capped, sealed and labeled by machines, and are then packed in cases for transfer to the warehouse where they await shipment. If the product made, however, is evaporated milk, it is conveyed to the processing room, where the necessary sterilizing of the sealed package is performed in large steam retorts. After the cans have been cooled, they are packed in cases and sent to the storage room.

A condensed milk plant properly operated buys its supplies in large quantities; milk-sugar, tin cans or tin plate for making its cans (a factory sometimes containing a complete can-making tin-shop); lumber in shooks for making boxes; so that nearly all the work incidental to completing the product is done in the factory. Such a plant represents a large investment.

Chemical Analysis.— As condensed milk forms such a very large and important item of food, especially for the infant, it is proper in this article to incorporate information on the question of analysis that the public may be correctly informed on the subject. For some years past, the methods for the analysis of condensed and evaporated milk products have been very unsatisfactory. Unless operated by analysts of considerable experience, the results were inclined to be decidedly misleading. It is a matter of record that many chemists have erroneously reported samples of superior brands of milk as skimmed or partly skimmed, when in reality, the error was solely in the work of the analyst.

In order to clarify this situation, the Milk Section of the National Canners Association appointed a committee to develop a method of analysis which would prove satisfactory to both the milk trade and the Federal authorities. After an exhaustive survey, the Roese-Gottlieb method was finally selected as being the most accurate and reliable one available. At the same time, collaborative studies were being conducted by the Association of Official Agricultural Chemists for the purpose of finding a method which would give concordant results in the hands of any competent analyst. As a result of this work, this organization adopted the Roese-Gottlieb method at its last meeting. In order, therefore, to secure official recognition, all analysts of condensed and evaporated milk products should be guided by the above recommendation. The fact that such a satisfactory method is now in use should do much to prevent such unfortunate misrepresentations as have occurred in the past.

Food Value.— An analysis of condensed milk (preserved) of high average quality would be about as follows:

	Per cent		Per cent
Fat	9.50	Ash	1.80
Protein	8.18	Cane sugar	40.50
Milk sugar	12.30	Water	27.72

The following analysis is representative of the evaporated milk now sold on the market:

	Per cent		Per cent.
Fat	8.00	Ash	1.51
Protein	7.12	Water	72.98
Milk sugar	10.39		

Of all the foods available to the public, it is doubtful if any rank as high in purity, keeping quality and uniformity. For infant feeding, household uses, for supplying the army and navy, shipping trade, exploring parties or pioneer life, no food article prepared has greater value.

A. W. Milburn,
President Borden's Condensed Milk Company.

CONDENSER, one who or the thing which condenses. Some of the methods in general use are:

Steam-engine.— An apparatus for reducing to a liquid form the steam in front of the piston, so as to obtain a partial vacuum at that point, and thus utilize the natural pressure of the atmosphere. Watt invented the injection condenser and the separate condenser. The surface condenser has a series of flat chambers or tubes, usually the latter, in which the steam is cooled by a body of water surrounding the tubes.

In the jet condenser the steam and water meet in an air-tight chamber. A modified form of the jet condenser, known as the siphon condenser, makes use of the Torricellian vacuum. Distilled water for ships' use is obtained by the condensation of steam in a surface condenser. Condensers are always employed on ocean-going steamships, never on locomotives. Elsewhere the practice varies.

Distilling.— The still-condenser is an apparatus generally made of the worm-tube form; the coil containing the alcoholic vapor traversing a tub which receives a constant accession of cold water, condensing the vapor in the coil. The liquid escapes at a cock valve below.

Metal.— An apartment in which metallic or deleterious gaseous fumes are condensed to prevent their escape into, and contamination of, the atmosphere. The device consists of a prolonged duct for the fumes, with showers of water to condense the arsenical, sulphurous and other fugitive volatile matters. It also serves an economical purpose in saving fugitive fumes of lead, zinc, mercury, sulphur, antimony and similar metals.

Electricity.— An instrument for concentrating electricity by the effect of induction. It usually consists of confolded sheets of tinfoil, whose layers are separated by a thin sheet having a non-conducting surface.

Other forms are the Leyden Jar, and the variable condensers made of metal sheets which can be moved in and out through an air gap, that are used in wireless telegraphy and for other similar purposes. With induction apparatus, a condenser may be used as a device for absorption or suppression of the extra current induced by the rapid breaks in the main current. See ELECTRICITY; INDUCTION.

CONDENSING AND NON-CONDENSING ENGINES. See STEAM-ENGINES.

CONDER, Claude Reignier, English army officer: b. 1848; d. 1910. He was educated at University College, London, and entered the Royal Engineers. He was chief of the Palestine survey in 1872–78 and in 1881–82. Later he served in Egypt and Bechuanaland and in 1887–94 was British commissioner at Ordnance Survey headquarters on the Transvaal border. In 1895 he was engaged in relief work in Ireland and served on the Irish Ordnance Survey from 1900 to 1905. He wrote much on the topography and archæology of Palestine. His published works include ‹Tent Work in Palestine› (1878); ‹Judas Maccabæus› (1883); ‹Heth and Moab› (1883); ‹Memoirs of the Palestine Survey› (1883; 1890); ‹Primer of Bible Geography› (1884); ‹Palestine› (1891); translation of the Tel el-Amarna tablets (1894); ‹The Latin Kingdom of Jerusalem› (1897); ‹The Hittites and their Language› (1898); ‹The Rise of Man› (1908); ‹The City of Jerusalem› (1909). He was also a contributor to Smith's ‹Bible Dictionary› and made a series of illustrations for Bunyan's ‹Pilgrim's Progress› in 1869 and made illustrations and maps for his own books.

CONDER, Josiah, Anglo-Japanese architect: b. London, 28 Sept. 1852. He was educated at the Bedford Commercial School (now the Modern School). He studied at the South Kensington Art Schools and Slade Life Classes at University College. He became architectural assistant to the late William Burges and become a student of the Royal Institute of British Architects. In 1876 he was engaged by the Japanese government as professor of architecture to the Imperial Japanese Engineering College, Tokio, and as architect of the Public Works Department. He designed and erected many government buildings and private buildings in Tokio. He also was lecturer in architecture at the Imperial Tokio University. In 1884 he received the fourth class decoration of the Rising Sun and in 1894 the third class of the Sacred Treasure. He is now retired and receives a life pension from the Japanese government, still retaining the position of honorary adviser in architecture to the Home Office and engages also in private practice. His publications include ‹The Floral Art of Japan›; ‹Landscape Gardening in Japan›; ‹Notes on Japanese Architecture›; ‹Paintings and Studies by Kawanabé Kyosai.›

CONDILLAC, kŏn-dē-yăk, **Etienne Bonnot de Mably de,** French philosopher: b. Grenoble, 30 Sept. 1715; d. Beaugency, 3 Aug. 1780. He founded an international reputation on ‹The Essay on the Origin of Human Knowledge (or Sense Perceptions)› (1746); duly succeeded by the celebrated ‹Treatise on the Sensations› (1754), the central standpoint of these and other works being what is, philosophically speaking, sensationalism; a belief, that is, that what we know we know only through the senses, and hence our ideas of deity, love, the soul, etc., are largely modified forms of the objects that impress us in our daily material experience. These standpoints were practically those of French philosophy till the advent of Cousin. Among his other works are ‹Traite des Sensations› (1755); ‹Cours d'Etudes› (1755); ‹Le Commerce et le Gouvernement Considérés Relativement l'un à l'autre› (1776); ‹La Logique› (1781); ‹Langue des Calculs› (1798).

CONDIMENTS, substances employed at table for the purpose of imparting a flavor to or seasoning ordinary foods. The principal condiments are common salt, butter, oil, vinegar, sugar, honey, ginger, mustard, pepper, pickles, etc. These not only are pleasing to the appetite but also supply various wants of the system, many of them being necessary to the proper functioning of the alimentary system.

CONDITION, in law a statement of terms, a provision or stipulation, as in a contract, by which the parties thereto consent to be bound; or an undertaking to do something, pay money or other consideration, etc., as a proviso in an agreement by which the other parties thereto bind themselves to perform some act in return. Conditions must be made at the same time as the original conveyance or contract, but may be by a separate instrument, which is then considered as constituting one transaction with the original. Unlawful conditions are void. Conditions in restraint of marriage generally are held void; but this is not true of conditions restraining from marriage to a particular person, or restraining a widow from a second marriage. A condition in general restraint of alienation is void, but a condition restraining alienation for a limited time is good. Where land is devised, there need be no limitation over to make the condition good, but where the subject of the devise is personalty without a limitation over, the condition, if subsequent, is held to be *in terrorem* merely, and void. But if there be a limitation over, a non-compliance with the condition devests the bequest. A limitation over must be to persons who could not take advantage of a breach. Performance should be complete and effectual. An inconsiderable casual failure to perform is not non-performance. Any one who has an interest in the estate may perform the condition, but a stranger gets no benefit by performing it. Conditions precedent, if annexed to land, are to be strictly performed, even when affecting marriage. Conditions precedent can generally be entirely performed, and usually at any rate equity will not interfere to avoid the consequences of non-performance.

The word «condition» also means the situation of every person in some one of the different orders of persons which compose the general order of society and allot to each person therein a distinct separate rank. For instance, at common law, a person under 21 is an infant, with certain disabilities and privileges. Every person is presumed to know the condition of the person with whom he deals.

CONDITIONAL IMMORTALITY, a tenet held by a theological school which denies the inherent immortality of the soul, and the consequent doctrines both of eternal misery and of Universalism as contrary to the teachings both of nature and of revelation. Its advocates maintain that the Bible sets immortality before men as something to be sought after (Rom. ii, 7), as a divine gift offered on certain conditions (Rom. vi, 23; John iii, 15, 16), and as a matter of hope and promise in the present life (Titus i, 2); that this immortality is not a present possession (Mark x, 30), and is to be realized by the assumption of a spiritual body at the resurrection of regenerate men from the dead (Luke xx, 35, 36), an event synchronous with the second coming of Christ (1 Cor. xv, 51, 52). Divine testimony, no less than experience, they say, declares unequivocally that man has the same natural life as all other animals (Eccles. iii, 19), and only those who by faith and obedience are united to Christ have the promise of immortality. The Calvinistic doctrine of eternal misery is untenable, the punishment of sin being death or everlasting destruction, to be inflicted subsequent to a judgment after the Lord returns (2 Thess. i, 9, 10). The dogma of Universalism, the only alternative to endless torment if the soul must live forever, is also, they maintain, unfounded, since the punishment of sin (death) is said to be everlasting, like the life which is the reward of the righteous (Matt. xxv, 46). The Conditional Immortality Mission began in Great Britain in 1878. It has an organ *The Bible Standard,* published monthly by the secretary. Churches have been established in the United States.

CONDITIONAL LIMITATION. (1) A condition providing for the determination of an interest in land upon the happening of a particular contingency. It is a present interest only, lasting until terminated by the happening of the contingency, and is synonymous with a limited or qualified fee, such as a grant of an estate in land so long as the grantee shall remain unmarried or while any of his children are minors. At common law a contingent interest formerly remained in the grantor of such an estate, and upon the happening of the contingency the property reverted to the grantor or his heirs. This rule was abolished in England by statute late in the 13th century, thus making such an estate an absolute fee, but in many States of this country it has been held that the old rule that the estate will revert to the grantor or his heirs remains in effect. However, the grantor of such an estate cannot legally alienate the contingent interest he may possess therein before the happening of the contingency which terminates the estate in the grantee. (2) A use or interest in land *in futuro* effective on the happening of a given contingency.

In this sense the term is synonymous with *shifting use* or *springing use.* For example, a conditional limitation is granted to D in the following clause of a deed: «Said land is granted unto A and his heirs to the use of B provided that, if C lives and reaches his majority, the land shall go to the use of D in fee simple.» Often the estate determines only upon breach of a condition, as where land is devised to A while he remains in a given city or State, and if he fails to do so, the property to vest in B unconditionally. Upon the happening of the prescribed contingency, the estate first limited comes at once to an end, and the subsequent estate arises. . . . A conditional limitation is therefore of a mixed nature, partaking both of a condition and of a limitation: of a condition because it defeats the estate previously limited; and of a limitation because, upon the happening of the contingency, the estate passes to the person having the next expectant interest, without entry or claim. 63 Am. Dec. 725 (at 727). This form of estate is common both in Great Britain and the United States.

CONDITIONED, Philosophy of the, or Philosophy of the Unconditioned. The name given by Sir William Hamilton to certain philosophical views first promulgated by him in an article contributed to the *Edinburgh Review,* in October 1829, forming a critique on Victor Cousin's philosophy, especially of his doctrine of an absolute cause. The Unconditioned is regarded by Sir William Hamilton as a genus including two species: the Infinite, or the unconditionally unlimited, and the Absolute, or the unconditionally limited; and the thesis which he maintains and expounds in the essay referred to, and which forms one of the leading doctrines of his philosophical system, is that the Unconditioned, as thus explained, is entirely unthinkable. In his own words, «the mind can conceive, and consequently can know only the limited, and the conditionally limited. . . . Conditional limitation is the fundamental law of the possibility of thought.» This he illustrates by stating that we can neither conceive an absolute whole, that is, a whole so great that we cannot conceive it also as a part of a still greater whole; nor an absolute part, that is, a part so small that we cannot conceive it as a relative whole, divisible into still smaller parts. And this he declares to hold good as to space, time and degree. «The Conditioned,» he goes on to say, «is the mean between two extremes — two unconditionates, exclusive of each other, neither of which can be conceived as possible, but of which, on the principles of contradiction and excluded middle, one must be admitted as necessary.» The Unconditioned, on the other hand, being merely negations of the Conditioned in its opposite extremes, bound together by the aid of language and their common character of incomprehensibility, is not even a notion, either simple or positive. It presents no object to the thought, and can afford no real knowledge. From this, however, we are only to learn that our faculties are weak, and that hence we have no right to constitute our capacity of thought into the measure of existence. Although then we are unable to conceive anything above the relative and finite, it is quite competent to us to believe in the existence of something unconditioned beyond the sphere of all that is conceivable by us. This doctrine was adopted by Mansel, dean of Saint Paul's, and applied by him to determine the limits of religious thought. It was combated by John Stuart Mill. Consult Hamilton, 'Discussions on Philosophy and Literature' (1852); Mill, 'Examination of Sir William Hamilton's Philosophy' (1865); Mansel, 'Limits of Religious Thought' (3d ed., 1870).

CONDOM, kôn-dôn, town in southeast France, in the department of Gers, on the Baïse River, which is here crossed by two stone bridges, 25 miles northwest of Auch. It contains an ancient church, a Gothic edifice of the 16th century, and in the outskirts are a number of handsome villas. The manufactures are iron founding, saw milling, porcelain, woolen yarn, leather and brandy. It was formerly the capital of Pays-de-Condomois. Bossuet was appointed Bishop of Condom in 1669, but remained here only one year. Pop. 6,380.

CONDONATON, in law, a forgiveness of injury, such as to restore the person who has committed an offense to the same position which he or she held before it was committed. In an action on the ground of adultery it is a legal plea in defense. If the act is committed anew, the condonation is annulled and the old charges are reconsidered.

CONDOR, the popular name of the great vulture of the Andes, formed by a mispronunciation of the Indian name *kunter*, which, according to Humboldt, is derived from another word in the language of the Incas, signifying «to smell well.» This species (*Vultur gryphus*, Linn., or *Sarcoramphus gryphus*) belongs to the family (*Cathartidæ*) of diurnal rapacious birds, and which is distinguished by the following characters: The bill is elongated and straight at base; the upper mandible is covered to the middle by the cere; the nostrils are medial, approximate, oval, pervious and naked; the tongue is canaliculate, with serrated edges; the head is elongated, depressed and rugous; the tarsus rather slender; the lateral toes equal; the middle toe is much the longest, the inner free and the hind one shortest; the first primary is rather short, the third and fourth are longest.

The natural history of the condor was in a fair way to rival the ancient fables of griffins, basilisks and dragons or even of exceeding the roc of Sinbad the Sailor, in extravagant exaggeration, until Humboldt placed it upon the basis of truth. His careful measurements established the fact that the wonderfully gigantic condor is not generally larger than the lämmergeyer, or bearded vulture, of the Alps, which it closely resembles in various points of character. These birds prefer to dwell above all animal life, and at the extreme limit of even Alpine vegetation, inhaling an air too highly rarefied to be endured, unless by creatures expressly adapted thereto. From such immense elevations they soar upward until their great bulk diminishes to a scarcely perceptible speck, or is lost to sight. The condor is a carrion bird, and is quickly lured to the plains by the sight or scent of a carcass. To such a feast considerable numbers repair, and commence their banquet by first plucking out the eyes, and then tearing away the tongue of the animal; next to these the bowels are eagerly sought for, and devoured with that gluttony which distinguishes the whole vulture tribe. Tschudi mentions one in captivity which ate 18 pounds of meat in a single day and had its usual appetite the day following. The appetite of these birds seems to be limited only by the quantity of food that can be gorged into their stomachs; and when thus overloaded they appear sluggish, oppressed and unable to raise themselves into the air. The Indians profit by this condition to revenge themselves for the robberies which they commit upon their flocks; and, watching while they eat until flight has become exceedingly difficult, attack and secure them by nooses, or knock them down with poles before they can get out of the way. If the condor, thus loaded, succeeds in rising a short distance from the ground, he makes a violent effort, kicking his feet toward his throat, and relieves himself by vomiting, when he soon ascends out of reach. Many, however, are surprised, and are captured or killed before they are able to ascend. But the condor does not exclusively feed upon dead or putrefying flesh; he attacks and destroys deer, vicuñas and other medium-sized or small quadrupeds; and when pinched by hunger a pair of these birds will attack a bullock, and by repeated wounds with their beaks and claws harass him until, from fatigue, he thrusts out his tongue, which they immediately seize and tear from his head; they also pluck out the eyes of the poor beast, which, if not speedily rescued, soon falls a prey to their voracity. It is said to be very common to see the cattle of the Indians on the Andes suffering from the severe wounds inflicted by these rapacious birds. It does not appear that they have ever attacked man. When Humboldt, accompanied by Bonpland, was collecting plants near the limits of perpetual snow, they were daily in company with several condors, which would suffer themselves to be quite closely approached without exhibiting signs of alarm and never showed any disposition to act offensively. The nesting-time of the condor varies with the latitude and the place selected for the nest is usually some inaccessible ledge of rock. It lays two white eggs from three and a half to four inches long, which are hatched in about seven weeks. The development of the young birds is very slow, since they are not able to fly until they are a year old, and they have to remain with the parent birds for a year or two longer. They are occasionally seen even on the shores of the southern ocean, in the cold and temperate regions of Chile, where the Andes so closely approach the shores of the Pacific. Their sojourn, however, in such situations is but for a short time, as they seem to require a much cooler and more highly rarified air and prefer lofty solitudes from 10,000 to 15,000 feet above the level of the sea. When they descend to the plains they alight on the ground rather than upon trees or other projections, as the straightness of their toes renders the first-mentioned situation most eligible. Humboldt saw the condor only in New Granada, Ecuador and Peru, but was informed that it follows the chain of the Andes from the equator to the seventh degree of north latitude into the province of Antioquia. There is now no doubt that it ranges from 9 or 10 degrees north of the equator to the Straits of Magellan. The king vulture (*S. papa*) is another bird of the same genus.

The head of the male condor is furnished with a sort of cartilaginous crest, of an oblong figure, wrinkled and quite slender, resting upon the forehead and hinder part of the beak for about a fourth of its length; at the base of the bill it is free. The female is destitute of this crest. The skin of the head in the male forms folds behind the eye, which descend toward the neck and terminate in a flabby, dilatable or erectile membrane. The structure of the crest is altogether peculiar, bearing very little resemblance to the cock's comb or the wattles of a turkey. The auricular orifice is of considerable size, but concealed by folds of the temporal membrane. The eye, which is peculiarly elongated and farther distant from the beak than the eagle's, is of a purple hue and very brilliant. The neck is uniformly marked by parallel longitudinal wrinkles, though the membrane is not so flabby as that covering the throat, which appear to be caused by the frequent habit of drawing the neck downward to conceal or warm it within the collar or hood. The collar in both sexes is a fine silken down, forming a white band between the naked part of the neck and beginning of the true feathers and is rather more than two inches broad, not entirely surrounding the neck, but leaving a very narrow naked space in front. The rest of the surface, the back, wings and tail are of a slightly grayish-black, though sometimes they are brilliantly black; the feathers are triangular and placed over each other tile-wise. Humboldt never saw male condors with white backs, though descriptions of such have been given by Molina and others. The primaries are black; the secondaries in both sexes are exteriorly edged with white. The wing-coverts, however, offer the best distinction of the sexes, being grayish-black in the female, while in the male their tips, and even half of the shafts, are white, so that his wings are ornamented with beautiful white spots. The tail is blackish, wedge-shaped, rather short and contains 12 feathers. The feet are very robust and of an ashen blue color marked with white wrinkles. The claws are blackish, very long and but slightly hooked. The four toes are united by an obvious but delicate membrane; the fourth is the smallest and has the most crooked claw. The largest male condor described by Humboldt was three feet three inches long from the tip of the beak to the tip of the tail; height, when perched, with the neck moderately extended, two feet eight inches; from the tip of one extended wing to the tip of the other, eight feet nine inches. Humboldt states that he never saw a condor which measured more than nine feet across the wings; but a specimen described by Dr. Shaw measured 14 feet. Notwithstanding, therefore, what is said by Humboldt of the general correspondence in size of the Alpine lämmergeyer and the condor of the Andes, we cannot avoid believing that a full-grown individual of the latter species would be much more than a match in every respect for any European species. The condor is peculiarly tenacious of life and has been observed, after having been hung for a considerable time by the neck in a noose, to rise and walk away quickly when taken down for dead, and to receive several pistol bullets in its body without appearing greatly injured. Its plumage defends its body to a considerable degree from the effects of shot. It is easily killed when shot, or struck sufficiently hard, about the head.

A very similar species is the California condor or vulture, which may be easily distinguished from the true condor, which it nearly equals in size, by the lack of the white neck-ruff and of the caruncle of the male. The California vulture formerly ranged on the Pacific coast into British Columbia, but its habitat is said to be shrinking and now reaches only to Monterey on the north. The species may be approaching extinction. Like the condor, in addition to feeding on carrion, it attacks and kills young or sick animals, particularly lambs and calves. The rough nest of sticks, in which two dirty-white eggs are laid, is built on the ground, rock ledges or stumps. Consult Adams, ‘The Condor’ (Vol. IX, California 1907); Beebe, ‘Zoological Society Bulletin, No. 31’ (New York 1908); Darwin, ‘A Naturalist's Voyage’ (London 1860); Lucas, ‘Annual Report of the United States National Museum’ (Washington 1891); Stejneger, ‘Riverside Natural History’ (Vol. IV, Boston 1885). For the California condor see Beebe, ‘Zoological Society Bulletin, No. 32’ (New York 1909) and Finley, ‘The Condor’ (Vols. VIII, IX, X, California 1906, 1907, 1908).

CONDORCANQUI, kŏn-dôr-kăn-kē′, **José Gabriel** (“Tupac Amaru”), Peruvian revolutionist: b. Tinta 1742; d. Cuzco, 18 May 1781. He is called “The Last of the Incas,” and in 1771 took the name of Tupac Amaru. In 1780 he incited the Peruvian Indians to rebellion against Spain, professing a design of restoring the dynasty of Manco Capac. This rebellion was the most important in South American colonial history. For some time the contest raged with doubtful success; at length, however, the natives fell away from him and he was taken and executed. The cruelty of the Spaniards in this insurrection ultimately led to the independence of Peru.

CONDORCET, kôṅ′dŏr′sā′, **Marie Jean Antoine Nicolas de Caritat, Marquis de**, French philosopher and mathematician: b. Ribemont, Picardy, 17 Sept. 1743; d. Clamat, 28 March 1794. He was educated by the Jesuits and showed a taste for mathematics at a very early age. Later he studied at the College of Navarre at Paris. At the age of 21 he presented to the Academy of Sciences an 'Essai sur le calcul intégral.' His 'Mémoir sur le problème des trois points' appeared in 1767. Both works were afterward united under the title of 'Essais d'analyse.' The merit of this work gained for him in 1769 the distinction of a seat in the Academy of Science. With astonishing facility and versatility Condorcet treated the most difficult problems in mathematics; but his genius inclined him rather to lay down beautiful formulas than to pursue them to useful applications. He became the friend of D'Alembert, Turgot and Voltaire, whose opinions influenced him greatly. His mind seized upon social problems, which he solved in a manner equally as brilliant as that of his famous contemporaries. In defense of free internal trade in corn, he wrote 'Lettre d'un laboureur de Picardie à M. N.' and 'Reflexions sur le commerce des blés' (1776). Against religious domination he wrote 'Lettre d'un theologien.' He also supported the American Revolution with great enthusiasm. His principal writings on this subject are 'Lettres d'un citoyen des États-Unis sur les affaires présentes' (1788); 'Lettres d'un bourgeois de Newhaven à un citoyen de Virginie' (1787); 'Reflexion sur l'esclavage des nègres' (1781). D'Alembert persuaded him to contribute to the 'Encyclopédie,' to which he responded by his facile and brilliant 'Eloges des academiciens de l'Académie Royale des Sciences morts depuis 1666 jusqu'en 1699' (1773). The ability which he manifested in this work gained for him the life secretaryship of the Academy of Sciences. In 1777 his 'Theory of Comets' gained the prize offered by the Academy of Berlin. The aversion of the minister Maurepas to Condorcet delayed his entrance into the French Academy till 1782. In 1785 appeared a distinguished mathematical treatise on the doctrine of probability. In the following year he married Sophie de Grouchy, a sister of Marshal Grouchy, a talented and beautiful woman. At about this time Condorcet became inspector-general of the mint, and at his residence at the Hôtel des Monnaies, there gathered the «Intellecti» of Paris. His 'Vie de Turgot' and 'Vie de Voltaire' appearing in 1786–87 became popular immediately. In point of style they are the best of his works.

When the Revolution finally came, Condorcet's eager and indefatigable pen rushed to the support of the democracy. He was chosen a member of the municipality of Paris (1790) and later a representative for Paris in the Legislative Assembly, of which he became a secretary. In this capacity he composed the addresses of that body to foreign powers and developed a strikingly comprehensive scheme of public instruction, which, after the turmoil of political strife had abated, was put into effective operation and still remains the basic structure of the French system of education. His program of organization had five steps: (1) primary schools; (2) secondary schools; (3) institutes; (4) lycées; (5) the Society of Arts and Sciences. After the flight of Louis XVI, Condorcet denounced royal authority as an anti-social institution and supported the National Convention. He took his seat in this body for Aisne and directed his first efforts toward the framing of a constitution, which was rejected. The trial of Louis XVI by the Convention was offensive to him, since he did not believe that body right in exercising judicial functions. He voted in favor of the removal of Louis and the infliction of any punishment except death. His critical and independent attitude toward the new constitution and toward the oppression of the Girondists and the terroristic principles of the party of the Mountain brought down on him the suspicion of the revolutionists. He was declared an outlaw. Refuge was found for him at the home of Madame Vernet, who did all in her power to prevent his escape and surrender to his enemies, even at the peril of her own life. Her words were remarkable for their lofty sympathy: «The Convention, Monsieur, may declare you outside of the law, it cannot place you outside of humanity.» While at her house he wrote 'Esquisse d'un tableau historique des progrès de l'esprit humain,' by which he is best known. This work is a philosophical treatise on the history of man, tracing his evolution from a barbaric stage to the age of reason. He conceives that the chief errors in civilization have been brought about by the mismanagement by the clergy and monarchs. He outlines the future of man's progress on three lines: (1) The destruction of inequality between nations; (2) the destruction of inequality between classes; and (3) the unlimited improvement of individuals, mentally, morally and physically. Condorcet derives his theories from no spiritual postulates. His appeal is always to reason and to emotion aroused through reason. He finally quitted the house of Madame Vernet, and was captured in a half-famished condition at Clamat by a member of the revolutionary tribunal of that town. His captors threw him into prison, pending trial, and on the following morning he was found dead, either from apoplexy, exhaustion or poisoning.

MADAME DE CONDORCET published a translation of Adam Smith's 'Theory of Moral Sentiments'; edited Condorcet's 'Éloges'; and, with Cabanis, published her husband's complete works (1801–04). Consult Arago, 'Biographie de Condorcet' (prefixed to the edition of 1847–49); Morley, 'Critical Miscellanies' (London 1893); Comte, 'Cours de philosophie positive' (Vol. IV); Cahen, L., 'Condorcet et la Révolution française' (Paris 1904); Guillois, A., 'La Marquise de Condorcet, sa famille, son salon et ses œuvres' (Paris 1897).

CONDOTTIERI, kŏn-dŏt-tyā'rē, class of mercenary adventurers in the 14th and 15th centuries, who commanded military bands, amounting to armies, on their own account and sold their services for temporary engagements to princes and states. The bands under command of the Condottieri were well armed and equipped. Their leaders had in many instances considerable military skill; but, as they took no interest in national contests, except to receive pecuniary advantages, the wars between them became a sort of bloodless contest, in which the only object of each party was to take as many prisoners as possible for the sake of the ransom. This singular system of warfare was put to an end by the more serious military operations of the French, who invaded Italy under Charles VIII. Though many Condottieri acquired much honor as well as emolument, one only attained to high rank and independent power; this was Francesco Sforza, originally a peasant, who in 1451 made himself Duke of Milan and transmitted that sovereignty to his descendants. Consult Semerau, 'Die Condottieri' (Jena 1909); Block, 'Die Condottieri: Studien über die sogenannten unblutigen Schlachten' (Berlin 1913).

CONDUCTING TISSUE, in botany, the system of vessels by which water and aliment is brought from one part of a plant to another.

CONDUCTION (from Latin *conductio*, bringing together). In botany, this is the technical name for the process whereby water and food-stuffs are transmitted from the roots of a plant to its trunk or stem and leaves. The paths by which these substances traverse the plant are well known. They enter the thin-walled root-hairs by osmosis, the food-salts being in a state of aqueous solution. From this point up, there is good evidence that the path of the water and the salts dissolved in it lies through the tracheids and the long tubular vessels of the fibro-vascular bundles, which are situated in the wood of the roots and stems of the Dicotyledons and Conifers, and form part of the leaf-veins. Only the young wood, however, takes part in this upward flow of sap. The motive force in the process has only recently been understood: the osmotic pressure of the juices of the root unquestionably plays a large part in the matter, but it is alone unable to make the sap rise to the tops of our larger trees. Furthermore, a cut branch with its end dipped in water will still show a flow of sap. Furthermore, if a living twig be divided under mercury, the wood-vessels will be found to contain some of the mercury on microscopical examination. As mercury will not enter a capillary tube of cellulose except under the action of a force, this result indicates that the pressure in the wood-vessels is less than that of the atmosphere. This could not be the case if root pressure were the only agent tending to produce the upward flow of sap; there must be accordingly some force producing a suction from above. This force is furnished by the osmotic attraction for water of the leaf-cells, whose contents are concentrated by evaporation and the consumption of their water in the photosynthesis of carbohydrates. This action is propagated from cell to cell until it reaches the vessels of the stem, each cell being, to put it loosely, sucked dry by its thirsty predecessor. This suction, producing a pressure in the vessels less than that of the atmosphere, causes the sap to give up part of its dissolved gases. This is probably one of the reasons why the vessels of a plant contain gases, which are, of course, in a state of rarefaction.

It has been shown that the path of the carbohydrates and other substances generated in the leaves is quite different from that of the water which comes up from the roots with its dissolved salts. For example, a girdled twig will keep green if its end is immersed in water, which shows that wood transmits water, but it will send down roots only from points above the injured region, because the portion of stem beneath the girdle has lost its power of obtaining food-material from the leaves and of growing thereby. The bark, therefore, and more specifically the bast layer of the bark, as it has been shown, is the path of the sap descending from the leaves. This layer contains the remarkable sieve-cells — elongated cells placed end to end in long chains, with the plates between adjacent cells in these chains perforated with numerous small holes. The mechanism of the transmission of food-stuffs appears to be diffusion.

In addition to the tracheids, vessels and sieve-tubes, we find another system of tubes in the vascular tissue of plants. This system bears the milky juice or *latex* of such plants as the rubber-tree, the dandelion and the milkweed. Though there is evidence that the latex exercises a nutritive function, the nature of this is not thoroughly known. Consult Timiriazeff, C. A., 'The Life of the Plant' (trans. by A. Cheremetieff, London 1912).

CONDUCTION OF HEAT. See HEAT.

CONDUIT, kŏn'dĭt, in a general sense a medium or means of conveying; anything serving as a channel for passage or transmission; in architecture, a long narrow passage between two walls or underground, for secret communication between various apartments, of which many are to be found in old buildings; also a canal of pipes for the conveyance of water, a sort of subterraneous or concealed aqueduct. The construction of conduits requires science and care. The ancient Romans excelled in them and formed the lower parts, whereon the water ran, with cement of such an excellent quality that it has become as hard as the stone itself which it was employed to join. There are conduits of Roman aqueducts still remaining, of from five to six feet in height and three feet in width. Conduits in modern times are generally pipes of wood, lead, iron, cement, reinforced concrete or pottery for conveying water from the main spring or reservoirs to the different houses and places where it is required.

CONDURANGO, kŏn-dŭ-răng'gō, or **CUNDURANGO**, (from the native Peruvian *cundur*, condor, and *ango*, vine), the bark of the Marsdenia Condurango or perhaps *Macroscepis*, a medium-sized twining plant of Ecuador and adjacent states. It is somewhat bitter; at one time it was much vaunted as a specific in the treatment of cancer.

CONDYLARTHRA, kŏn-dĭ-lār'thrạ, a primitive order of fossil ungulates of the early part of the Tertiary Period, collateral ancestors of the later hoofed animals and connecting them with the primitive clawed animals, especially with the *Creodonta*. They were mostly of small size, five-toed, omnivorous, with bunodont teeth like those of the pigs, long tail, small brain and other primitive features. *Phenacodus*, of the Lower Eocene, of the size of a wolf, is the largest and best known. Remains of *Condylarthra* are found chiefly in North America, but also in Europe and in South America. They became extinct in the Middle Eocene.

CONDYLE (Fr. *condyle*, Lat. *condylus*, Gr. *kondulos*, knuckle), kŏn'dĭl, in anatomy, a protuberance on the end of a bone serving to form an articulation with another bone, and more especially applied to the prominence of the occipital bone for articulation with the spine; to the distal extremity of both the humerus and femur and to the proximal articular extremity of the lower jawbone of mammals.

CONDYLE, in ancient Greece, a lineal measure one-eighth of a foot.

CONE, Helen Gray, American poet: b. New York city, 8 March 1859. Since 1899 she has been professor of English in the New York Normal College (now Hunter College). She is the author of 'Oberon and Puck: verses Grave and Gay' (1885); 'Baby Sweethearts' (1890); 'The Ride to the Lady and Other Poems' (1891); 'Soldiers of the Light' (1910). She assisted Jeannette L. Gilder in editing 'Pen Portraits of Literary Women' (1887).

CONE, Orello, American educator and author: b. Lincleau, N. Y., 16 Nov. 1835; d. 23 June 1905. He was professor of biblical languages and literature in Saint Lawrence University, N. Y., 1865–80; president of Buchtel College, Ohio, 1880–96; and Richardson professor of biblical theology in Saint Lawrence University, 1900–05. He published 'Gospel-Criticism and Historical Christianity' (1891); 'The Gospel and Its Earliest Interpretations' (1893); 'Paul, the Man, the Missionary, and the Teacher' (1898); edited 'Epistles to the Hebrews, Colossians, Ephesians, Philemon, etc.' (1901); 'Rich and Poor in the New Testament' (1902).

CONE, Spencer Houghton, American clergyman: b. Princeton, N. J., 30 April 1785; d. 28 Aug. 1855. After a varied career as school teacher, actor, journalist and government clerk, he joined the Baptist Church in 1813 and began to preach. He was chaplain of the House of Representatives, 1815–16; pastor at Alexandria, Va., for seven years; of the Oliver Street Church, New York, for 18 years, and of the Broome Street Baptist Church in the same place from 1841 until his death. He was president of the American and Foreign Bible Society, 1837–50, and of the American Bible Union from its formation until he died. For many years he was one of the most popular and influential clergymen of his denomination in the United States. There is a 'Memoir' of him by his son, Spencer Wallace Cone (1819–88).

CONE. (1) *In geometry,* the solid figure traced out when a right-angled triangle is made to revolve round one of the sides that contain the right angle; this is more strictly a right circular cone. A more comprehensive definition may be given as follows: Let a straight line be held fixed at one point and let any other point of the line be made to describe any closed curve which does not cut itself; the solid figure traced out is a cone. The moving line is known as a generating line or generator of the cone. When the axis of the cone, that is, the line joining the fixed point to the centre of symmetry of the closed curve, is perpendicular to the plane of the base, the cone is right; and when in addition the curve which the second point describes is a circle, the cone is a right circular cone. Cones whose axis are inclined to their bases at any angle other than a right angle are known as oblique cones. If a cone be cut in two by a plane parallel to the base, the lower portion is called a frustum or a truncated cone. The geometry of the cone is important on account of the curves called conic sections, which are obtained by cutting a right circular cone by planes in various directions. The cubic content of a cone is one-third of that of a cylinder on the same base and of the same altitude. The cubical content of the cone is therefore found by multiplying the area of the base by the altitude and taking one-third of the product. The area of the slant or curved surface of a right circular cone is obviously equal to that of a sector of a circle of radius equal to the slant height, an arc equal to the circumference of the base. It is therefore obtained by multiplying the slant height by the circumference of the base and taking one-half of the product.

(2) *In botany,* a dry compound fruit, consisting of many open scales, each with two seeds at the base, as in the conifers; a strobilus.

(3) *In geology,* the heap or mountain of ash, cinders and lava piled up around a volcanic vent. Small cones on the flanks of larger ones are called parasitic. The term cone is also applied to the mound of silicious sinter (q.v.) built up around a geyser. See GEYSERS; MOUNTAINS; VOLCANO; and the section on *Volcanism* in the article on GEOLOGY.

CONE-NOSE. A true bug (*Conorhinus sanguisugus*) of the family *Reduviidæ,* related to the bedbugs and having similar habits in the South; it is nearly an inch long and black, blotched with red. In 1898 much excitement was occasioned in the North by newspaper accounts of attacks by "kissing-bugs," which were two related species, *Opisocœtus personatus* and *Melanolestes picipes,* the former frequently found in dirty houses feeding upon cockroaches, bedbugs, etc., and breeding in dusty corners. The bite is painful, but not poisonous.

CONE-SHELLS, or **CONIDÆ,** a family of ctenobranchiate *Gastropoda,* so called on account of their form. All the cones have a similar external outline; the aperture is long and narrow, the head of the living animal is more or less lengthened, the proboscis elongated, the foot is splay and abruptly cut off in front, the tentacles are rather widely separate and the eyes are placed on these organs. All of the species are carnivorous. Several hundred species have been described, about one-fifth of them from tropical American waters. Owing to their beauty and variety the cones are much sought by collectors, who pay extravagant prices for the rarer forms. The textile cone-shells (*Conus textilis*), brought from Mauritius, a handsome species four or five inches in length, are marked with narrow, angular lines of dark brown, variegated with dashes of yellow and irregular white spots. They haunt the fissures and holes in rocks and warmer pools in coral reefs. They all take a moderate range of depth, varying from 1 to 40 fathoms.

CONEPATL, or **CONEPATE,** kō'nĕ-pāt, the name given in Mexico to *Conepatus,* the large white-backed skunk of that region. See SKUNK.

CONES, Pyrometric, or **SEGER CONES,** instruments for measuring heat, consisting of three-sided pyramids about two and a half inches high and one-half inch base. They are composed of fusible substances and are graded so that they melt, each at its own temperature. The cones were invented by Dr. Hermann Seger, of Berlin, for use in pottery kilns and have since been largely adopted. An earlier method of heat measurement was the fusible alloys invented by Prinsep. Alloys of silver, gold and platinum were so calibrated that they would, as to melting-point, cover the whole range between the two extremes of fusion of the metals. Many objections to these were found in practice, notably the expense and liability to loss. The Seger cones perform the same service and are very inexpensive. The cones range in numbers from 1 to 36 and back from .— 1 to .— 22. In practice two or three cones, approximating the required temperature, are set upright in the kiln upon a morsel of soft clay. The softer of them will, as the temperature reaches the proper point, bend over and melt, to be followed in regular order by the successive higher numbers. They can be easily seen through the hole left in the kiln wall for the inspection of trials.

CONESSI-BARK, the bark of *Holarrhena anti-dysenterica,* of the family *Apocynaceæ,* a plant of India, used as a tonic, a febrifuge and an astringent in diarrhœa. The plant is a shrub with opposite leaves and terminal cymes of flowers.

CONESTOGA, kŏn-ĕs-tŏ'ga, or **CONESTOGAS,** a tribe of Indians belonging to the Iroquois linguistic stock, and formerly living on the lower course of the Susquehanna and at the head of Chesapeake Bay. At the time of the settlement of Virginia (1607) the Conestoga were at war with the Mohawks, whom they had almost exterminated. Later they became a source of serious trouble to the white settlers. With the Dutch and Swedes they were more friendly than with the English. By 1675 the tribe was holding land on the eastern bank of the Potomac River in Maryland. Giving way before the Iroquois they retreated southward, committing depredations upon the white settlements. Some of the refugees of the tribe escaped to North Carolina; others after submission to the Iroquois returned to the Susquehanna. In 1701 the Conestoga made a treaty with William Penn.

CONEY, CONY (Lat. *cuniculus*; M. E. *cony, cunig,* rabbit). The word is believed to be of Hispanic origin and to have been borrowed into Latin. The name was formerly given in England to the rabbit. In the western United States, the name is applied to a distant relative, the pika (q.v.), although this creature has little resemblance to the rabbit. The term as found in Scripture is a translation of the Hebrew *shaphen,* the local name for the Syrian species of hyrax, or daman. The word Coney enters into a number of family and local names, as for example, Cunningham (Conyngham), Coney, Coningsby, Conington and Conythorp. The fur of conies or rabbits once much used in England, was called cony. The word also has the signification of a simpleton, dupe, gull. In the 17th century in England the den of thieves, cheats and swindlers was known as their warren, and their victims as conies, which, in this case, has the sense of young, inexperienced rabbits. This is the origin of the term simpleton as attached to the rabbit. See Hyrax.

CONEY ISLAND, New York city, small island in the borough of Brooklyn, about 10 miles southeast of the borough of Manhattan. It is about five miles in length and from half to three-quarters of a mile in width; separated from the mainland by Coney Island Creek, a narrow tidal inlet, Gravesend Bay and Sheepshead Bay. It is connected with the boroughs of Manhattan and Brooklyn by steam and electric railroads and steamboat lines. It is a noted day summer resort and has numerous bathing houses, hotels, concert and other amusement halls, carousels, pavilions, electric lights and a fine cycle path connecting it with Prospect Park, Brooklyn. Coney Island is divided into four sections: Sea Gate, the home station of the Atlantic Yacht Club; West Brighton; Brighton Beach and Manhattan Beach. There is a lighthouse at Sea Gate and many summer cottages, besides the Atlantic Yacht Club House. Sea Beach is the site of several charitable sanatoria and is a popular pleasure resort. Brighton and Manhattan have extensive hotels and are the preferred resorts for the wealthier class. There is a splendid theatre at Brighton Beach and also the Brighton Beach race-track. Coney Island was one of the first landing-places of the Dutch, and for over 200 years was considered a worthless waste. In 1840 steamboats began making excursions there and for 25 years it was a popular resort. In 1875 steam railroads were built and since then the island has been the most popular resort in the immediate neighborhood of New York. In 1903 the city opened a small public park on the island; and again in 1911.

CONFARREATIO, kŏn-făr-ē-ā'tyō, the most solemn of the three ceremonies of marriage used among the ancient Romans. The other forms of marriage were *coemptio* and *usus.* These last are the only ones mentioned by Cicero, which shows that confarreation had fallen into disuse before his time. The ceremony was performed by the *pontifex maximus,* or *flamen dialis.* A formula was pronounced in the presence of 10 witnesses, and the man and woman partook of cake of salted wheaten bread; part of which only they ate, the rest being thrown upon the sacrifice, which was a sheep. The cake was called *far,* or *panis farreus,* hence the term «confarreatio.» By this form the woman was said to come into the possession of her husband by the sacred laws, and became a partner of all his substance and sacred rites, those of the penates as well as the lares. If the husband died intestate and without children, the wife inherited the whole property like a daughter; if there were children, she received with them an equal share. The offspring of this form of marriage were called *patrimi* or *matrimi;* and from them were chosen priests and priestesses, especially the *flamen dialis* and vestal virgins. In the reign of Tiberius, he wished for a priest of this pure lineage, but the ceremony had fallen into disuse, so that three patricians thus qualified could not be found. Confarreatio could only be dissolved by a form of divorce equally solemn, called *disfarreatio.* The custom of bride cake is a relic of confarreatio; until within 200 years it was made of wheat or barley, without fruit.

CONFECTIONERY (Lat. *conficere,* «to put together,» «compound,» «prepare»), a general term for any preparation with sugar as a base, used as a sweetmeat and containing nuts, fruits or other flavoring. In the United States confectionery is commonly called «candy,» a name which suggests etymologically conserved fruits or seeds; in England "boiled sweets" is the usual term, derived from the commonest method of preparation. Historically the earliest use of confectionery was to disguise the taste of unpleasant medicines, a method dating back to the primitive smearing with honey the rim of a cup holding a bitter draught, a practice common with Greek and Roman doctors. The medicinal use was long the commonest, fruit conserves being the first exception. In Italy, even in the Middle Ages, *confetti* were used in the mock battles of the carnival maskers. The true development of the manufacture of confectionery began in the 19th century, and in England, where the trade spread after the great exhibition of English dealers at the Exposition of 1851, to Germany and France. The latter country took the lead in the manufacture of elaborate bonbons and confitures and was especially superior in its chocolate candies. But the greatest growth of the business and especially the greatest increase in the variety of confections has been in the United States. The custom of making "confectionery" without the use of sugar was common in Mexico at the time of the Conquest. Different kinds of fruits were dried, mixed and compounded so as to make sweetmeats. The Indians soon learned the value of sugar in sweetening and preservation of these compounds; and "confectionery" in the modern sense was used in Mexico and Central America before it appeared in Europe where it was probably brought through the medium of Spain.

CONFECTIONERY TRADE. It is doubtful if there is any modern industry that has experienced more radical changes during the past hundred years than the trade of confectionery-making. Prior to the year 1851, the manufacture of "boiled sweets," as candy was then called, was so largely an English specialty that the manufacturers of Great Britain might be said to have had almost entire control of the industry. In fact, it was not until the time of the great international exposition at London that the confectioners of other countries began to realize just how much their British brethren had achieved, but their unique display of candies and sweetments gave such an impetus to the trade that the effect was felt in every part of the civilized world. Germany imitated all its choicest products; France excelled, especially in the making of chocolate bonbons, and the candy-makers of the United States returned from the "big show" with ideas that soon made the importation of English sweets unnecessary.

In spite of the fact that England had long been the great candy-making country of the world, however, there had been confectioners in the United States long before the opening of the London exposition, and there are ample records in proof of the fact that they, too, had produced original creations that other nations were glad to copy. As early as 1816 there were no less than 20 confectioners in the city of Philadelphia, all of whom were engaged in the manufacture and sale of candies. Among these pioneers in the confectionery business one may record the names of Sebastian Henrion, who was succeeded by the firm of Henrion & Chauveau, in 1844, and Sebastian Chauveau, the first candy-maker to manufacture gum-drops, jujube paste and marshmallows in the United States. Another prominent manufacturer of the old time was Paul Lalas, who, in 1831, changed his business from that of candy-making to that of sugar-refining, while the list of Philadelphia confectionery-makers includes the names of George Miller, William N. Herring, S. S. Rennels and J. J. Richardson. Among the many old-time confectioners in the city of New York were Ridley & Company, a firm that was established as early as 1806; R. L. Stuart, James Thompson, John Stryker and Delmonico Brothers. In Boston, as early as 1816, Arnold Copenhagen, Lawrence Nichols and William Fenno were prominently identified with the candy industry, while Joseph Bouvey, Augustus M. Price and John L. Bridges were among the leading manufacturers and dealers in confectionery in Baltimore. Throughout the United States there were some other cities that could boast of candy-makers, but the records of those days are so meagre that but few of the names can be recalled.

In the beginning, of course, the art of candy manufacture was in a very crude state. Prior to 1845, it was almost invariably the rule that the manufacturers themselves sold at retail practically all the candy that they manufactured. As a rule this stock in trade was confined to such ordinary products as the old-fashioned stick candy, sugar plums and the ordinary molasses candy. Finer goods, or candies in fancy shapes, were almost exclusively imported and were sold at a much higher price than the crude candies of home manufacture. About 1825 the foreign manufacturers began to use a little machinery in their factories, but the actual introduction of machinery in the making of confectionery dates from about 1840. The first machine of this character to be brought to the United States was imported by Sebastian Chauveau of Philadelphia, in 1845. This was a revolving steam-pan. In 1846 Oliver R. Chase, who, with his brother, formed the firm of Chase & Company, invented a machine for the making of lozenges. For some years this firm had been engaged in making this once popular confection as a specialty, and it was to meet the constantly increasing demand for their product that this new invention was conceived and constructed to their model. In 1866, a further innovation in the lozenges manufacture was produced by Daniel G. Chase. This was a machine for printing on candies, and it was to this invention that the well-remembered conversation lozenges owed its existence.

Since that day the history of the confectionery trade has been a constant record of development. Year by year new improvements have been made and new and more perfect machinery has been invented, all of which have quickly been adapted to the manufacture of the various kinds of goods that the constantly widening demands of the business have required. While the actual manufacture of candy has extended until it has become one of the nation's greatest industries, it has created around it a number of dependent industries, each of which now represents a special business of no slight importance. Thus, for example, the making of confectioner's machinery is now a separate industry in which a great amount of capital is invested, and the business of confectioner's supplies represents an annual product that is by no means to be despised.

There are other factors that have played an important part in this extension of the confectionery industry. The low prices of sugar and the other materials used in the making of confectionery have exerted an influence, the effect of which cannot be disregarded, while the introduction of new and improved machinery in all our candy factories has a tendency to reduce the cost of manufacture to such a degree that the American producers have been able to make the best goods at a cost so low as to bring them within the reach of all.

Much of the credit for this satisfactory condition of affairs is due to the labors of the members of the National Confectioners' Association of the United States. This organization, founded in 1884, which includes in its membership all the leading candy manufacturers of the country, has for its declared purpose, "to advance the standard of confectionery in all practicable ways, and absolutely to prevent hurtful adulterations; to promote the common business interests of its members, and to establish and maintain more intimate relations between them; to take united action upon all matters affecting the welfare of the trade at large."

Since this association has been in existence the results of its work have been clearly manifested in the securing of necessary legislation in the several States by means of which the manufacture or sale of all candies containing harmful ingredients or poisonous coloring matters has now been prohibited by law; by effectually stamping out all attempts at adulteration which were once so common among the makers of the cheaper grades of goods, and by the establishment in the mind of the consumer of a degree of confidence in the purity of the American product that is a strong argument for the purchase of such goods. As the result of this happy combination of circumstances we have the great American confectionery industry of to-day.

Candies may be divided roughly into hard and soft grades. The hard candy is made of sugar, glucose, flavoring and coloring, with sometimes additions of nuts, etc. Starch is a leading constituent of soft candies. The hard candies were the first to be made by machine, but gradually mechanism has been developed for making soft and fancy candies largely by machinery, and makers of high-priced, hand-made candies are kept busy devising new concoctions to keep ahead of the machine product. Cane-ground sugar is almost wholly employed, and for hard candy the proportion is usually 85 per cent sugar to 15 per cent glucose. Glucose being a pure product of Indian corn adds to the nutritive value of candy. The hard candy ingredients are mixed in copper kettles and cooked, more heat being required in summer than in winter to ensure a hard candy. When cooked it is poured on a slab and cold water run on. Marble is now seldom used for slabs, steel proving more satisfactory. The product is then kneaded and pulled on a hook until white. It is pulled by hand, the candy-maker wearing buckskin gloves; or it may be pulled by an ingenious machine with continuous cranks that imitate the motions of hand-pulling. When it is pulled white, it is cut into sticks, slabs or rolled into balls or other forms.

In a large candy factory the sugar, glucose, starch and other materials go to the top floor, where all operations are begun. Here are the steam-jacketed cooking kettles. If starch goods are being made, the cooking kettle used is directly over the "depositor" machine on the floor below, so that the mixture may go down by gravity. If hard candy is being made, the first kettle is right over the continuous cooker. If it is cream candy, the kettle is positioned to discharge to a cooler; when cooled the cream goes to a beater and is distributed in trucks. The centres or soft interiors go to a coating-machine, styled an "enrober," which supplies the familiar chocolate coating, and then to the coolers and packers. Traveling platforms are employed where gravity is not available. In the modern candy factory the formulas used are exact, everything is measured and weighed and no guesswork permitted, hence spoiled batches are rare.

Very numerous machines have been developed for performing the different processes and producing the desired varieties of confectionery. The number of machines required for a varied product was so great that an equipment became burdensome to the manufacturer. Therefore in recent years the machine manufacturers have bent their energies to reduce the number of machines required in a candy factory, and to simplify the processes, as well as to eliminate hand labor. One of the most interesting of these machines is the Mogul, which is really a combination of machines grouped in one. It takes a pile of starch trays, filled with candy and starch, hardened to the desired degree, picks the bottom tray from under a pile, carries it to a screen and turns it upside down, delivering the contents to the screen, restores the tray to position, passes it under a cascade of starch, levels off the starch and brushes it up neatly, prints all the starch molds in a tray at one operation and adds the exact amount of candy desired, then delivers the tray to a truck to go to the drying-room. Surplus candy dosed with starch is automatically cleaned by the machine for reuse.

The work of this Mogul machine is done in some factories by three machines, the Simplex starch buck, which cleans molded candy, refills and levels the trays; the Springfield printer, which prints the molds in the leveled trays of starch; the Springfield depositor, which deposits candy into molds. The enrobing machine, which chocolate-coats centres, is often provided with an attachment for making extra heavy bottoms, as for chocolate drops. The enrober has an ingenious decorating attachment. The centre candy is rotated under a fine stream of colored chocolate or other tinted liquid and may thus be decorated with an endless variety of patterns. An enrober will dip 6,000 cream bars in a day.

The old-fashioned vacuum pan is disappearing from candy factories and the continuous cooker taking its place; it uses more glucose and less sugar and gives a glossy product. The disc reducer and disc refiner for chocolates displace a whole line of old machinery. The reducer grinds the chocolate, mixes in the granulated sugar, butter, etc., and the mixture is pumped as a fluid to a revolving disc operating between two stationary corrugated discs, where the mixture is refined in a few seconds. The candy-maker also uses gooseberry or ball machines for round candies; specially designed packing tables, wrapping machines for doing up the candies in dainty individual wrappers, syrup coolers, cream beaters and a variety of minor conveniences.

Statistics.— Few industries have grown as rapidly and extensively as the confectionery industry of the United States. In the 30 years from 1880 to 1910, the number of employees and the gross production increased nearly six times. The capital invested has risen from $8,486,000 in 1880 to $97,467,000 in 1914. In 1900 there were more candy factories (2,921) than in 1914 (2,317), but the total 1900 production of confections was valued at only $55,997,000, as against $170,645,000 in 1914, a gain of over 200 per cent. In 1914 there were 65,791 persons employed in the industry, receiving annually $33,813,000, of which the 53,658 factory operatives got $21,472,000, and the clerks and salaried men $12,341,000. This was over three times the wages paid in 1900. The value of the materials used rose from $35,354,000 in 1900 to $101,015,000 in 1914; and the factory production from $60,643,000 to $170,845,000. But to this latter figure must be added upward of $5,000,000 production of confectionery made in bakeries and other establishments, leaving the total of 1914 as a round $175,000,000. In 1916 the figure was estimated to be $200,000,000. These totals are somewhat misleading, however, for the true measure of an industry is not its gross production, but the value created above the cost of the materials used. This latter according to the special census of 1914 was $69,830,000 in the factories and about $3,000,000 in the other manufacture, leaving $73,000,000 as the actual measure of the industry in America, above the cost of materials used. These figures include the establishments making chewing gum which is classified by the United States Census Bureau as a branch of the confectionery industry. (See CHEWING GUM). New York is the leading State in confectionery, having 18 per cent of the production; Pennsylvania and Massachusetts each have nearly 12 per cent, Illinois 8, Ohio 5 and Missouri and Wisconsin each 4 per cent.

The chocolate and cocoa industry lives mainly on supplying the confectionery trade with materials, producing $22,390,000 of goods in 1910. Probably $13,000,000 of this went into candies. The most costly ingredient is of course the sugar, bought from the refineries, and the next the glucose, purchased of corn products manufacturers. For further detail of the confectionery industry consult Grilten, 'Modern Practical Gum Work Manual' (1911); Friedman, 'Common Sense Candy Teacher' (1912); and the files of the *Candy News*.

CONFEDERACY, Daughters of the. See UNITED DAUGHTERS OF THE CONFEDERACY.

CONFEDERATE STATES OF AMERICA. The name adopted by the Southern States which seceded from the Union and formed a government at Montgomery, Ala., 9 Feb. 1861, comprising South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana, with Jefferson Davis of Mississippi President, and Alexander H. Stephens of Georgia Vice-President. Texas, Arkansas, Tennessee, North Carolina and Virginia afterward joined, and Missouri and Kentucky became disputed territory, the Federal Congress and the Confederate each receiving and welcoming delegations claiming to represent those States.

The act of secession was passed by each State in full confidence that the legal right peaceably to secede was assured by the Constitution. And if the interpretation of any ambiguous provisions or expressions in any contract is to be governed by the joint intent of the parties at the time of making it, this right to secede must be conceded by all impartial historians.

Goldwin Smith, the English historian, has written: «Few who have looked into the history can doubt that the Union originally was, and was generally taken by the parties to it to be, a compact, dissoluble, perhaps most of them would have said, at pleasure; certainly on breach of the articles of union.»

Henry Cabot Lodge of Massachusetts has written: «It is safe to say that there was not a man in the country, from Washington and Hamilton on the one side, to George Clinton and George Mason on the other, who regarded the new system as anything but an experiment entered upon by the States, and from which each and every State had the right peaceably to withdraw, a right which was very likely to be exercised.»

In 1803, at the purchase from France of the Louisiana territory, and again in 1812, at the declaration of war with Great Britain, influential and leading public men in New England not only asserted the right of secession, but urged its exercise, in the celebrated Hartford Convention (q.v.) in 1814–15.

Nowhere, however, until 1860, was the issue actually made. Had it been made in the earlier days, it would doubtless have been accomplished peacefully. But in all human affairs, political, social, moral or commercial, there are silently but forever at work forces which make for the survival of the fittest, and the passing away of the unfit; and these forces, when at last a crisis has been reached, declare themselves, and operate with a volcanic power, against which the barriers of no constitution can prevail.

Within the lifetime of a generation the moral sense of a majority of the civilized world had grown to condemn the institution of slavery; and the invention of steam-power, railroads and telegraphs had begun to knit communities into nations, to their great commercial advantage. The prejudices against slavery gave rise to issues between the sections of the country, which became inflamed by events — such as the raid of John Brown—until certain States were wrought up to the point of seceding.

But now — born, not legitimately of the Constitution, nor of consent between the States (which could never have generated anything more cohesive than a rope of sand), but of inexorable laws of nature — there stood a giant in the path. Perhaps, indeed, it was of origin unsanctioned by legal form. But it was born of proximity and geographical dependency, and it was nourished by the prosperous tide of commerce already beginning to transform the entire world. It already felt itself the natural heir to the vast and rich territory within its grasp. There it stood in the way of peaceable secession — a young nation, which denied the right of secession and stigmatized it as rebellion.

In vain did President Davis plead his constitutional rights, in a message to his Congress: «We protest solemnly, in the face of mankind, that we desire peace at any sacrifice, save that of honor. In independence, we seek no conquest, no aggrandizement, no concessions of any kind, from the States with which we have lately been confederated. All we ask is to be let alone; that those who never held power over us shall not now attempt our subjugation by arms.»

It needed now but a first blow to precipitate a war to the death. Concerning first blows, Richard Cobden once said: «From the moment the first shot is fired, or the first blow is struck, in a dispute, then farewell to all reason and argument: you might as well attempt to reason with mad dogs as with men when they have begun to spill each other's blood in mortal combat.»

The first blow came speedily, but by deliberate intent of neither party. In Charleston a status quo had been agreed upon by both sides, to permit negotiations. On 25 Dec. 1860, Maj. Robert Anderson seized Fort Sumter. He did so by night, without orders, and contrary to his instructions, abandoning Fort Moultrie and disabling its guns. President Buchanan was about to order him to return to Fort Moultrie; but before the order could be issued the act was approved so enthusiastically by Northern politicians that he did not dare to reverse it. Holding Fort Sumter, he was then constrained to dispatch an armed force to provision and supply it. Thus the Civil War was begun, the Confederates not waiting for the arrival of the armed force, but making their attack.

This breaking out of hostilities brought into the Confederacy the Border States, not so vitally interested in the subject of slavery, but with every tradition and instinct keenly alert to their legal rights under the original Constitution.

This was the real issue of the War, and not slavery, as is often loosely asserted. It is attested, not only by the titles «Union» and «Rebel,» universally applied to the two armies by the North, but by the passionate claim of the Confederates that their struggle was for that liberty of self-government so dear for ages to the Anglo-Saxon race. And at the Fort Monroe conference in February 1865 between President Lincoln and Vice-President Stephens, the South's surrender of her claim to integrity of the Union was the one point upon which Lincoln insisted, and the one which Stephens could not yield, although utter destruction awaited him scarcely 60 days off. It is further shown in the desperate character of the struggle upon both sides, involving, with equal ardor, individuals and communities of most diverse degrees of interest in the question of slavery.

The combatants were very unequally matched, and as each side was in deadly earnest, the final outcome of the contest was inevitable from its beginning. On the Union side was a population of over 20,000,000, with an army, a navy, a treasury, a highly developed system of transportation by land and sea, as well as of manufactures, of commerce and of credit. On the Confederate side was a much scattered population, almost entirely agricultural, of about 5,000,000 whites, comparatively destitute of all those elements of military strength. Even their agriculture was so little devoted to food products that actual starvation of men and horses in their armies finally hastened the inevitable end.

Besides the whites, there was a population of 3,000,000 slaves. It was believed by many at the North that if their freedom was proclaimed by President Lincoln, as a war measure, while their masters were absent in the field, they would rise in insurrection, or at least desert their labor in mass. The experiment, however, being tried, proved a failure. The slaves generally remained faithful everywhere, except in the sections overrun by the enemy. During the four years of the war there were actually mustered into the Union army 2,898,304 men. The Confederate numbers cannot be accurately known, but the total white male population between the ages of 18 and 45 was, by the census of 1860, 984,475. In 1864 the ages of military service were extended to include all between 17 and 50, an act which was described by General Grant as «robbing the cradle and the grave.» Nearly 2,000 battles and skirmishes were fought, and in them the number of killed and wounded on the Union side is officially given as 389,345. The numbers on the Confederate side are not accurately known, no complete records existing, but they are estimated at about 300,000.

Of lives lost in the war from battle, wounds and disease, the official records of the Union army report 316,516. The lives lost in the Confederate army could not have been less than 250,000.

The Confederates appreciated the odds against them, but with firm conviction of the righteousness of their cause they trusted to be able by fortitude and endurance to wear out and discourage their adversaries. The fighting was often very desperate as shown by the casualties upon both sides, which frequently exceeded the casualties of the severest battles of Europe. Upon three occasions, some historians have imagined, the Confederates were within reach of very important results.

At Bull Run, the first battle of the war, the Federals were completely routed and Washington might have been captured, it is supposed, had the victory been followed up. Gettysburg is considered by many to have been the crisis of the war, a desperate attack by the Confederates being repulsed. But there is strong evidence that the greatest period of discouragement on the Union side followed the battle of Cold Harbor, 3 June 1864. It was, however, of brief duration and of no effect. Successes elsewhere soon followed and made it apparent that the Confederate resources were approaching exhaustion.

There are notable parallels between the war for the Union and the war between Great Britain and the Boers, in the issues involved and in the course of their events. Like the Confederates, the whole of the Boer population considered themselves fighting for personal liberty as against subjection to a foreign power. Like the Confederates, the Boers fought practically without pay; and although they were inferior in numbers their important engagements were generally victories; or, if not victories, were drawn battles. And as the end came to the Confederates, so it came to the Boers only with their utter exhaustion — through their being worn out, rather than defeated in battle.

But a great contrast is to be found in the treatment of the two peoples after their defeat. That of the Boer was liberal and generous, fully in accord with the civilization of the day. To parallel the treatment of the South every effort must have been made to put the political control of the country into the hands of the Kaffirs. Of course the efforts to give the negro political control over the Anglo-Saxon at the South were foredoomed to failure. They prolonged ill-feeling for 10 years; but subsequent events, notably the Spanish War, at last inaugurated a new era in which few traces of it yet linger. And it is due to history to record that it is unlikely that any such effort would ever have been made, but for the assassination of Lincoln. Although for this unspeakable crime and folly the South was in no way responsible, it brought upon her a whirlwind of resentment and at the same time it removed a President who, there is evidence to show, had already risen to the height of his great opportunity as a statesman, and was now planning terms of liberality upon which to reconstruct the Southern States.

Within the few days that intervened between the surrender at Appomattox and the assassination of Lincoln, one in his close confidence prophesied that his plans of reconstruction would «win over the South's good will and affection, and astonish the world.» And in giving his plans effect, no one can doubt that he would have had the cordial as well as powerful aid of General Grant, who had already set the example of magnanimity, and won the gratitude of Lee's army by the generosity of his terms of surrender.

History records no crime greater than that of the assassin, who cheated the civilization and humanity of the world of the great example which Lincoln would have set to all nations, and who sowed bitterness and ill-will between the sections, bringing poverty and distress to the South, to the North the mortifying failure of its political experiment and to the negro only an injury. But in connection with the negro question, as it confronts us to-day, it may be remarked that the problem of the races can be safely committed to time and to the racial instincts implanted by the Creator.

The Constitution which was adopted by the six States in Montgomery, February 1861, and in turn accepted by the others, was modeled closely after that of the United States. It forbade the slave-trade, or the importation of slaves from any foreign country other than the slaveholding States and Territories of the United States. It forbade «bounties» or «trusts» and provided a «tariff for revenue.» It allowed the President to veto any part of a bill and approve the remainder, giving his reasons for such action; and fixed his term of office at six years and made him ineligible for a second term.

The internal history of the Confederate States during the Civil War furnished a most instructive lesson as to the weakness of the bond by which they had associated themselves. Already, before the close of the war, it had proved itself but little better than the federation of the colonies for the Revolutionary War. The last message of President Davis to the Confederate Congress, and the answering report upon the message by a committee of the Senate, contained much crimination and recrimination, and revealed an utter loss of confidence between the executive and the legislative branches, fatally paralyzing all action, and impossible to be healed. In a letter to the Secretary of War, on 5 March 1865, Judge John A. Campbell, assistant secretary, wrote: «The political condition is not more favorable. Georgia is in a state that may properly be called insurrectionary against the Confederate authorities. Her public men of greatest influence have cast reproach upon the laws of the Confederacy and the Confederate authorities, and have made the execution of the laws nearly impossible.» In several of the other States there were also very serious issues between State and Confederate authorities.

In view of these facts, and of the history of all confederations of many small countries, it may now be clearly seen that the prize for which the South contended so strenuously would have proved but a calamity had she won it. There would have been in the country a condition of unstable equilibrium, with many centres of disturbance, which would surely have involved further division and probably further wars. To-day her people are citizens of a nation second to none in military renown or commercial strength, or in its power and influence for peace and civilization among the peoples of the earth. Were the right peaceably to secede, for which the South cheerfully endured all the bitterness of war, now tendered her as a free gift, every State would unanimously reject it as a curse.

Few generations of modern times have confronted sterner problems than did the men of the South in 1861. In the natural world, whenever the climate has changed, the fauna and flora have had to change to conform to new conditions. This is the law of evolution, the one great truth of which mankind may feel assured «Eternal Justice» will alone prevail through «Conformation to Environment.» And the natural resistance to change by all interests in possession makes evolution mean war to the death of the least fit and the survival of the fittest.

Had the South been quick to apprehend these truths, then being first published to the world by Darwin, she might have accepted compensation for her property in slaves and surrendered her constitutional right to secede. Had she done so, over 500,000 lives and $10,000,000,000 of property would have been saved.

But the Anglo-Saxon is not a ready barterer of what he deems his «rights.» Nor would any nation thus founded upon «consent» have commanded confidence, or even inspired the national pride and loyalty which form the greatest treasures of a people. The conflict, with all its death and destruction, its sorrows and its sufferings, was but the necessary baptism of this nation, legitimating its disputed birth by a verdict in the great high court of war, rendered in accordance with the laws of evolution, beyond which there is no appeal.

But while the generation which so lavishly poured forth blood and treasure may rightfully cherish to the last an ardent affection for its "Lost Cause," with its leaders and its heroes, not only its own children, but all succeeding generations, will enjoy great and enduring benefits and blessings, the very fruit of the desperation of its struggle and of the utterness of its defeat.

And in its influence upon national character, and upon the standing of this nation among other nations, it is no small matter to have made the record for valor and devotion to principle which the South has set; or to have produced such leaders and types as Lee and Jackson and their colleagues.

Briefly it may be said that the rise and fall of the Confederate States of America constitute the most important feature of modern history, marking the sudden birth of a great nation. Such a nation could never have been founded in peaceful debate. The world may eventually reach a stage of development where such an event may be possible, but it had not done so in 1860. Previous to that date there was no assurance of stability to the nation. Since 1865 no convulsion could shake it. Succeeding years only demonstrate to the inhabitants of every section the increasing advantages of living in an undivided and an indivisible country. See UNITED STATES — THE CONFEDERACY.

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EDWARD PORTER ALEXANDER.

CONFEDERATE STATES OF AMERICA, Recognition of the. The failure of the Confederate government to secure recognition was not due to lack of confident or persevering effort or deficiency in number of agents sent abroad. Unsuccessful in its effort to negotiate a peaceful separation by a commission sent to Washington, and failing in a plan to form an alliance with Mexico, it continued to press for recognition at the chief courts of western Europe. At the beginning its hope of success was largely based upon the dependence of Europe on the supply of Southern cotton and no serious consideration was given to the possibility of a blockade such as that which became the determining factor in preventing independence. It continued to expect that the need of cotton would force recognition or intervention by England and France or by France and Spain, whose West Indian possessions she offered to guarantee in return for alliance. These hopes were temporarily raised by the *Trent* affair, by the earlier policy of the British government in failing to prevent the escape of Confederate cruisers built in English ports, by Lee's invasion of the North preceding the battle of Gettysburg, and by the later complications of France in Mexico which encouraged Napoleon to favor a counterpoise to the growing strength of the United States. They declined with the progress of events, but were revived by the prospects of an Anglo-American or a Franco-American war and by attempts to impress England and France with the belief that the United States was planning aggression against neighboring possessions or that the restoration of the Union would result in an aggressive war against England and France and finally feeling that European public opinion was opposed to slavery the Confederacy in its last death struggle offered emancipation for recognition and intervention.

Attempts to secure recognition of independence failed because of conditions over which the Confederate government had no control and could not fully appreciate. Recognition was prevented largely by the diplomacy of Seward, the proclamation of emancipation, the increasing success of Federal military operations, and the obstinate persistency of the Federal government in avoiding any official communication which might be interpreted as a recognition of the existence of even a *de facto* Confederate government. To this may be added the friendly attitude of the Russian government and the hesitation of the English government to join France in a policy which would have been resented by the American government as excessively unfriendly. Although during the war, the United States government, usually through military officers, from necessity communicated informally and unofficially with the agents of the Confederate authorities in regard to such questions as exchange of prisoners and terms of surrender, it persistently avoided any formal act which could have been interpreted as a recognition of the Confederate government. This is illustrated by the character of the Hampton Roads Conference. The Federal courts have always held that the Confederate States were "an unlawful assemblage without corporate power" and that the government of each separate indestructible State when it chose to act as a part of the Confederate States did not exist either *de jure* or *de facto*. The British proclamation of neutrality of 13 May 1861 (followed by similar declarations by France, Spain and other powers), which recognized the belligerent rights of the Confederacy on the ground that it was justified by the declaration of an effective blockade of the insurgent ports by the *de jure* government at Washington at the beginning of the war, was strenuously but unsuccessfully opposed by Seward who affirmed that the neutrality proclamation of the European powers would be liable to be construed as a recognition of independence and really created the belligerency of the Confederacy which had not exhibited a single privateer upon the ocean nor shown capacity to maintain any kind of warfare except in its own harbor. This concession of belligerency was not withdrawn by England and France until June 1865 although Seward took steps early in 1862 to secure its revocation or revision. Charles Francis Adams took some consolation in observing that Great Britain by this act had released the United States from liability for the misdeeds of the Confederates toward her. The United States courts have repeatedly decided that a state of civil war, which entitled the Confederacy to recognition as a belligerent, did not exist until President Lincoln issued his proclamation of 16 Aug. 1861 (based on the act of Congress of 13 July).

In the face of reported danger of European recognition of Confederate independence Seward urging that the likelihood of success was the only ground for recognition frequently issued instructions or circulars defining the American position against such action or against any form of European mediation or intervention. Seward early notified England and other powers that the recognition of the «so-called Confederate States» would be regarded in the United States as intervention and war to create a hostile state within the national boundaries — and that it would result in the immediate suspension of diplomatic relations and would be resented on the principle of self-preservation. He objected to the reception of Confederate commissioners by other nations or the consideration of any proposals which might seem to recognize the Confederate States in any way except as a part of the United States. Although he continued to insist that the informal reception of Confederate emissaries by officials of foreign governments was improper and unfriendly to the United States and consistently governed his own conduct accordingly in cases of unofficial missions from other countries, he left untried the policy of retaliatory non-intercourse which he early proposed in his instructions to Adams. In the summer of 1861 he revoked the exequatur of a British consul at Charleston who with the authority of his government had conducted negotiations with the Richmond authorities in regard to the rights of neutrals; and he could not grant the right claimed to communicate with a *de facto* government such as the central authority at Richmond or the governors of separate States to provide for temporary security of persons or property of British subjects or to claim redress and reparation although Earl Russell declared that such communications did not imply any acknowledgment of the Confederacy as an independent state. With the knowledge that France and England, acting in concert on questions relating to the American Civil War, might try by combined pressure to prevent the United States from regulating its own internal affairs, he announced that he could not recognize any combination or understanding of the powers, and insisted upon dealing with each government separately. He also declined Napoleon's offer of mediation, the officiousness of which was rebuked by Congress. Seward's efforts to prevent recognition were greatly aided by the Russian government which refused the invitation of the French emperor in the autumn of 1862 to co-operate on some plan of intervention to stop the Civil War, and later sent its fleet to American waters to show friendship for the American Union just after the crisis of the middle of 1863 during which Napoleon, before the arrival of the news of Gettysburg and Vicksburg, had hoped to push the careful government of England into a policy of joint recognition and intervention.

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James M. Callahan,
Professor of Political Science, University of West Virginia.

CONFEDERATE VETERANS' ASSOCIATION, a federation of all organizations of survivors of the Civil War on the Southern side. This association was organized at New Orleans 10 June 1889. Its avowed purpose is strictly social, literary, historical and benevolent. Its constitution says that it «will endeavor to unite in a general federation all associations of Confederate veterans, soldiers and sailors now in existence or hereafter to be formed; to gather authentic data for an impartial history of the War between the States; to preserve relics or mementos of the same; to cherish the ties of friendship that should exist among men who have shared common dangers, common sufferings and privations; to care for the disabled and extend a helping hand to the needy; to protect the widows and the orphans, and to make and preserve a record of the resources of every member, and, as far as possible, of those of our comrades who have preceded us in eternity.» State organizations are authorized, and are called divisions. Local organizations are termed camps. Of these there are about 1,200, organized into three departments: Army of Northern Virginia; Army of Tennessee and the Trans-Mississippi Department. The badge worn on the lapel of the coat is a miniature Confederate flag, square in form. The official organ, *The Confederate Veteran,* is published at Nashville, Tenn. The organization numbers about 50,000.

CONFEDERATION, Articles of. See United States — Articles of Confederation.

CONFEDERATION OF THE RHINE. A league of German princes which was formed, under the protection of Napoleon, in 1806. In the war of 1805, which turned out so unfortunately for Austria, several of the princes of the south of Germany allied themselves to France. The Peace of Presburg (26 Dec. 1805) gave the first impulse to the entire dissolution of the German empire, by conferring crowns on the electors of Bavaria and Würtemberg, and on both, as well as on Baden, complete sovereignty, such as had been already exercised by the other great German states. Ultimately 16 German princes made a formal declaration of their separation from the Emperor and the Empire, in the act of confederation signed at Paris 12 July 1806, by the kings of Bavaria and Würtemberg, the elector arch-chancellor of the Empire, the Elector of Baden, the new Duke of Clèves, and Berg (Joachim Murat), the Landgrave of Hesse-Darmstadt and other less important rulers. Other princes soon joined, and ultimately the confederacy extended over a space of 125,160 square miles, with 14,608,877 inhabitants; and the confederate forces were increased from the originally stipulated number of 63,000 to 119,180. After Napoleon's Russian campaign of 1812 the whole structure fell to pieces in 1813. Consult Rambaud, 'La domination française en Allemagne, 1804–11' (Paris 1876), and any good history of Germany.

CONFERENCE (Lat. *conferre,* «to bring together») (1) In general a meeting for consultation, discussion, instruction or the like; or any interview for interchange of views. The term is specifically applied to consultations between committees of the two Houses of Congress in the United States, and to similar consultations between delegates of the two Houses of Parliament in Great Britain. Such conferences are usually called to discuss the provisions of a bill with regard to which the two houses are disagreed, with the object of effecting an agreement between them.

(2) A term much used in ecclesiastical government, etc. The annual meetings of Wesleyan preachers in England for deliberation on the affairs of the body are called conferences. In the United States the Methodist Episcopal Church has an assembly called the general conference, which meets once in four years; numerous assemblies called annual conferences; district conferences; and quarterly conferences; these assemblies variously dealing with local or general interests of the Church. In the Roman Catholic Church there are instituted pastoral conferences, chapter conferences, etc.; and in various Protestant denominations there are stated local or general assemblies of chosen delegates from individual churches, who meet to consider or adjust denominational affairs.

(3) The word conference also covers international meetings, and there have been many noted international conferences, some of which have been of a religious nature. Of these latter a very notable gathering was the ecclesiastical conference called together by King James I of England and which met at Hampton Court Palace in 1604, for the establishment of a common creed. It led to King James' famous translation of the Bible which is still known to all Protestant English-speaking readers as the «Authorized Version.» Another famous ecclesiastical gathering was that known as the Savoy House conference, which at a meeting held in 1661 made some important changes in the Prayer Book of the Established Church of England. Political conferences have been many and some of them important. The conferences of London and Geneva both held in 1864; two other conferences of London held respectively in 1867 and 1871 and the Balkan conference also held in London (1912–13) form links in the chain of modern history; while the conference of The Hague of 1899 and recent meetings of a similar nature have attracted general attention.

CONFERVA (Lat. *con,* «together,» and *fervere,* «to be hot»), kŏn-fĕr'va, a genus of green algæ. Most species are marine, though a few are freshwater. The name is also applied to a genus of the *chlorophyceæ.*

CONFESSION, *in criminal law,* the voluntary admission or declaration made by a person who has committed a crime or misdemeanor, to another, of the agency or participation which he had in the same. *Judicial* confessions are those made before a magistrate or in court in the due course of legal proceedings. *Extra-judicial* confessions are those made by the party elsewhere than before a magistrate or in open court. Confession is admissible only when voluntary; but if it is obtained by temporal inducement, threats, promise or hope of favor held out to the party in respect of his escape from the charge against him, by a person in authority, it is not allowed. Likewise, if the confession is made in answer to questions not containing or in any way implying threats or bribes, it is then admissible. A confession differs from a statement or declaration in that the former applies to an acknowledgment of guilt after the deed has been committed and does not apply to a mere statement or declaration of an independent fact from which such guilt may be inferred. The court primarily determines whether the confession is voluntary or not. If the various evidence conflicts as to whether the confession is voluntary, the court may leave it to the decision of the jury with the direction that they shall reject the confession, if on hearing the whole evidence, they are convinced that it was not the voluntary act of the defendant. See Criminal Law.

CONFESSION, Sacramental, the act of a penitent accusing himself of his sins to a priest who has power to grant absolution, it is called auricular confession because addressed to the ear (*auricula*) of the minister of the sacrament of penance, and not made in open congregation; though of course were such public confession to be made the priest would, unless the laws of the Church should forbid, possess the same power of absolution as in auricular confession. The law of the Catholic Church, as defined by the Council of Trent, requires that the faithful shall confess to a duly commissioned priest all their mortal sins, and are advised to confess venial sins, committed after baptism and since a previous confession and absolution, so far as they can recall them by a diligent examination of their conscience. The penitent is strictly required to confess all his mortal sins, their kinds and their number as well as he can recall them; wilful concealment of a mortal sin or even of what the penitent may erroneously deem a mortal sin, renders the confession of the penitent and the absolution of the minister null, and both of these acts must be done over again and made good. If a penitent, after examination of his conscience, fails to recall any mortal sin he is under obligation to confess that sin afterward and to receive absolution for it. See Absolution.

CONFESSION AND AVOIDANCE, a plea showing new facts by which it is designed to negative the allegations in the pleading of the adverse party. It may apply to the whole or to a part of the pleading, but if only to a part it must be so stated. This plea expressly or impliedly admits at least the apparent truth of the allegations of the plaintiff. All statements in confession and avoidance must be both specific and clear. Pleas in confession and avoidance must conclude with a verification.

They must plead matter either in excuse and justification or in discharge, as a release.

CONFESSION OF FAITH, Westminster, a document prepared by the Assembly of Divines which met at Westminister in obedience to an ordinance of Parliament issued 12 June 1643. The whole number of the assembly amounted to 174 members, 32 of whom were members of Parliament appointed as lay assessors. The greater part of the assembly were Puritans. One of the chief results of the deliberations of the Assembly was the framing of the Confession of Faith, intended to be that of the national Church of Great Britain. In England it nominally held this position for a short time. On the return of the Scottish commissioners it was laid before the General Assembly of the Church of Scotland, by whom it was adopted as the creed of the Church by the act of assembly of 27 Aug. 1647. It has been adopted by the other Presbyterian churches generally, in some cases, however, with certain reservations. Its theology and discipline are thoroughly Calvinistic. See CREEDS; WESTMINISTER ASSEMBLY.

CONFESSIONAL, in Roman Catholic churches and chapels, a kind of enclosed seat, stall or box in which the priest sits to hear persons confess their sins. The confessional is often not unlike a sentry-box, the priest sitting within and the penitent kneeling without and speaking through an aperture. Many confessionals are in three divisions or compartments, the centre, for the reception of the priest; the side compartments, which communicate with the centre by grated apertures, are for the penitents. The word confessional is often used in the sense of the tomb of a martyr or confessor. Sometimes an altar was erected over the grave and the name was extended to the altar. If a church was erected over the tomb another altar was placed, in the building, exactly over the tomb with its altar below. The upper altar was called a confession or confessional.

CONFESSIONS, Les, an autobiographical work of Jean Jacques Rousseau (q.v.). It was written during the six most agitated years of his life, from 1765 to 1770; and his state of health at this time, both mental and bodily, may account for some of its peculiarities. The first six books were not published until 1781, and the second six not until 1788. According to more than one critic, the 'Confessions,' however charming as literature, are to be taken as documentary evidence with great reserve. They form practically a complete life of Rousseau from his earliest years, in which he discloses not only all his own weaknesses, but the faults of those who had been his friends and intimates.

CONFESSIONS OF AN ENGLISH OPIUM EATER. The 'Confessions' exist in two distinct forms. The earliest form, containing the two papers printed in the *London Magazine* for September and October 1821, appeared the next year (1822) and passed through no less than six editions in the next 30 years without essential change. In 1845 De Quincey began a series of articles in *Blackwood's Magazine*, under the title "Suspiria de Profundis, being a sequel to the Confessions of an English Opium Eater;" but the series ran through only four numbers. In 1856, however, when he collected and arranged his writing for a uniform edition, he rewrote the volume of 1822 throughout, enlarging it to nearly three times its original dimensions. The introductory chapter, in particular, which in 1822 had been a brief account of his early years, was now enormously expanded by the insertion of some matter from the Suspiria and by crowding into it a multitude of incidents and experiences, many of which have no connection with opium eating and some of which seem to have been drawn rather from his imagination than from his memory.

This enlarged edition is really a vivid picture of De Quincey himself, not only as the opium eater, but as the scholar, the critic, the gossip. His mind was abnormally active; but he could never follow a straight line of thought or course of narrative. Everything reminds him of something else. But if the story takes a long time to get anywhere, its path is set thick with curious incident and subtle observation. Even the dreams and phantasies of the opium eater were not due principally to opium. De Quincey was a dreamer always. His early childhood, years before he ever tasted the drug, was largely passed in a mood of waking dream; in his autobiographic papers we find record of hours when visions in sight or sound, vague and solemn, came upon him with the compelling sense of reality. The effect of opium in later years seems to have been to recall these earlier experiences with strange vividness, to combine other incidents with them, and to repeat them habitually in his dreams. Indeed, the very best specimens of what he calls his dream phantasy seem not to have been suggested by any particular experience, or to have owed anything to the influence of opium. That wonderful fragment, the Three Ladies of Sorrow, from the Suspiria, is an embodiment of three of the darkest forms of human grief, mysterious but strangely vivid, but without a hint of anything morbid in its genesis — a work of the pure creative imagination.

It is in such passages as this we may see at its best that particular form of prose-poetry which De Quincey claims to have been of his own invention. He always admired the large, sonorous style of the early 17th century men, and sometimes caught their manner very successfully. In the 1822 edition of the 'Confessions' is an apostrophe to opium, imitated from Walter Raleigh's famous apostrophe to death, which is quite as lofty as its original. This elaborated style is indeed ill adapted to the rambling gossip that makes up so large a part of De Quincey's writing, but his passages of revery and dream owe their strange effect upon our sensibilities very largely to their stately movement and music. Consult Saintsbury, 'Essays in English Literature' (1780–1860); Stephen, Leslie, 'Hours in a Library' (1st series); Winchester, C. T., 'A Group of English Essayists.'

CALEB T. WINCHESTER.

CONFESSIONS OF SAINT AUGUSTINE, The. Autobiographies are as a rule utterly conventional and commonplace, interesting only to those immediately concerned with the author. We have any number of them that are waste paper, but a few of them like Cellini's life of himself, Montaigne's 'Essays,' and Rousseau's 'Confessions,' show that when a man pours himself out he can make a supremely human document that is enduring literature. Among these immortal autobiographies, probably the work that has had most influence, in the intellectual world at least, is 'The Confessions of Saint Augustine' (354–430 A.D.). He wrote them shortly after he became bishop of Hippo, just before 400 A.D., when he was in his early forties. The fact that the book has maintained its popularity now for over 1,500 years shows from how close to the human heart it is written. For the Confessions are the history of Augustine's heart. We have two other sets of autobiographic documents from his hands, the 'Retractations,' which are the story of his mind, and his letters, which give an account of his activities. These two are little known beyond the narrow circle of students of theology and Church history. Most writers of autobiography seem to think that it is the story of their minds and actions that will interest men around them. Augustine's immortal record of his affections which still continues to attract the attention of each generation of thinkers shows that it is by the heart men live. Saint Augustine's Confessions are not, however, as so many people imagine, an account of past deeds and above all not an avowal of youthful transgressions as such. The word confession is used in the biblical sense of the Latin word *confiteri* as an acknowledgment. Augustine's Confessions are quite literally the acknowledgment of a soul forced to admire the action of God within itself, though it has to admit the many obstacles that it placed in the way of Divine influence. It is full of the psychology of human conduct, though so many people seem to think that only in comparatively recent years have men begun to reflect thus carefully on their inner activities. It has been said of the book, «neither in respect of penetrating analysis of the most complex impressions of the soul nor communicative feeling, nor elevation of sentiment, nor depth of philosophic views, is there any book like it in all literature.» As Augustine was one of the profoundest intellectual geniuses of human history, famous above all for his marvelous insight into human motives and his capacity to describe the various states of the soul and the facts of the spiritual world, it can be readily understood why this little book in which he set no barriers in his desire to reveal for God's honor and glory all that had gone on within him in the motivation of his life should be of supreme human interest. He was a psychologist of the psychologists, and while he was the greatest of the Fathers of the Church in the sense of being the authoritative expounder of the esoteric meaning of more of her doctrines than any other, he is also the patron and master in their own estimation of more of the heretics of the ages than any other, because the matter that he dealt with was so profound that it is rather easy to twist his meaning to anyone that the disciple may wish to have in order to support his own opinion. The psychology of the 'Confessions' has probably more interest for our generation than other features of the work. The excursions into child psychology in the first book exemplifying that a child has definite tendencies away from law and order toward neglect of study and precept, learns not by rules but by example, and observes closely the inconsistencies of elders, have drawn many a one to reading the rest of the book. The boy Augustine was very human, hated Greek and liked «the empty tales of the poets,» and blames like everyone else the method of his education and yet confesses how much more of good than of ill came to him from it. He went through his salad years when he liked to pity himself and has a chapter «On Weeping and Why It is Pleasant to Be Wretched.» Above all he shows very clearly how much personal affection meant to him. The death of a friend overwhelms him, but companions serve to distract him; his mother rescues him, not his principles; he comes under the personal influence of Ambrose; always it is personality that draws him. He soon came to realize that the claims of his intellect for satisfaction were incapable of fulfilment. «For I withheld my heart from all assent dreading a downfall; and came nearer being killed by the suspense. For I wished to be as assured of the things I saw not, as I was that seven and three are ten. . . . But as it happens that one who has tried a bad physician fears to trust himself to a good one, so was it with the health of my soul, which could not be healed, but by believing, and for fear of believing falsehoods, refused to be cured.» (Book VI, chap. 4). Augustine's 'Confessions' will probably always continue to be a favorite book for those who like himself have learned the lesson that the heart life of man is ever so much more important than his intellectual life. Consult 'The Confessions of Saint Augustine' (The Ancient and Modern Library of Theological Literature, New York 1886); Schaff, 'Saint Augustine' (ib. 1854); Farrar, 'Lives of the Fathers' (London 1889); Harnack, 'Augustins Confessionen' (Giessen 1895). Many modern writers on philosophic subjects have monographs on some phase of Augustine's thought: Renan, Eucken, Spalding, McCabe, Reuter, etc.

JAMES J. WALSH,
Author of 'Catholic Churchmen in Science.'

CONFESSOR, in the Roman Catholic Church has two principal significations. (1) Denoting a canonized male saint outside of the classes of the apostles, evangelists and martyrs. The only saints, who in the earliest times were publicly venerated in the Church after death were, in addition to the Blessed Virgin and the apostles, the martyrs; and such are all the saints named in the Roman canon of the Mass, though the Milan canon (Ambrosian) has the name of other saints. (2) the other meaning of the word confessor, the priest who hears confessions, answers to the more correct Latin word *confessarius*. The confessor, minister of the sacrament of penance, does not exercise that ministry simply in virtue of his having received priestly order: he must receive jurisdiction from the bishop of the diocese. The general law of the Church requires each of the faithful to resort to the confessional at least once in every 12 months, and to make confession each to his own parochus or parish priest; but under the law they may now lawfully confess to any priest who has due authorization from the bishop.

CONFIDENTIAL OR PRIVILEGED COMMUNICATION. In law, a communication made by one person to another which the latter cannot be compelled to give in evidence as a witness. The laws of the United States and of some other countries are, that all communications made between a client and his agent, between the agent and the counsel in a suit, or between the several parties to a suit, shall be treated as confidential; but in some minor points the practice varies in the different States. Legal agents are of course required to produce any papers entrusted to them by their clients, which the clients themselves would otherwise have been required to produce. The privilege of confidentiality regarding disclosures made to a medical adviser, even although it may have been necessary for the patient to make them in order to enable the physician to understand and treat his case, have not been defined by statute, but the custom has been that such communications are privileged. The same holds true regarding confessions made to a priest. No instances are cited where the confession of a penitent has ever been revealed by a priest. Communications made between husband and wife during marriage are in some States not admissible as evidence, although in most civil cases a husband and wife may legally be called as witnesses against each other. The laws in the United States differ in different States regarding the admission of testimony of husband or wife for or against each other.

CONFIRMATION (Lat. *confirmare*, «to make strong»), one of the seven sacraments of the Roman Catholic Church; in the Lutheran, the Anglican and the Protestant Episcopal Church confirmation is not a sacrament, but only a solemn rite wherein the one who is confirmed renews in the face of the Church the promises made on his behalf by his sponsors in baptism. Confirmation admits the person upon whom it is conferred to the status of a communicant and to full membership in the Church. In the early times of the Catholic Church the sacrament or rite of confirmation was administered immediately after baptism, even of infants: hence the two rites have often been, even by orthodox writers, viewed as one; and in the Greek and Oriental churches this custom still persists. But in the present discipline of the Latin Church confirmation is usually not administered till about the 12th year, though a child might be held competent to receive it at the age of seven. It is customary for the confirmant to take an additional name as a memorial of the rite. In administering it the bishop — and the bishop is the ordinary minister of this sacrament — with chrism (q.v.) marks the sign of the cross on the forehead of the recipient, and gives him a gentle slap on the cheek, in signification that he must be ready to suffer for Christ's name's sake. The formula of words used by the bishop in signing the confirmant is, «I sign thee with the sign of the cross and I confirm thee with the chrism of salvation, in the name of the Father, and of the Son, and of the Holy Ghost.»

CONFISCATION. *In international law*, the act of one state in appropriating property belonging to another state or to its subjects, either as a belligerent right or as a punishment for carrying contraband of war, blockade running or the like. The term is used also to indicate the seizure of property by the state as an act of punishment for non-compliance with the law, as for violation of internal revenue regulations.

In English law some early authorities, including Blackstone, seem to use the term as a synonym for «forfeiture,» though at common law it has been held to embrace only seizure by the Crown of goods found on a felon, but not claimed by him, and to articles dropped by a thief fleeing from justice. (See FORFEITURE). By statute in England, passed in 1914, enemy property which had been subjected to confiscation by the Crown was placed under the care of a legal custodian.

In Roman law goods which had been subjected to confiscation by the state were called by the civilians *bona confiscata*, and belonged to the *fiscus*, or imperial treasury.

One form of confiscation long known to international law is called *angaria* or *angary*, which is defined as the seizure or destruction of neutral property by a belligerent when urgently necessary, with due compensation later. This right was exercised in the Franco-Prussian War by Germany.

In the United States, enemy property has frequently been confiscated under international law and by Federal statutes. In 1861 and 1862, during the Civil War, Federal statutes were passed providing for the confiscation of property used for insurrectionary purposes, and these statutes were later held to be constitutional by the Supreme Court. Congress, dating from the adoption of the Constitution, has had the exclusive power of confiscation of alien property. Shortly after the outbreak of hostilities with European powers in the spring of 1917, the United States seized a large number of ships belonging to Germany and Austria found afloat in various ports, under a well-known rule of international law justifying the act. By a Federal statute enacted 6 Oct. 1917, a legal custodian was appointed for all alien enemy property confiscated in the United States during the war then pending.

By proclamation of the President of the United States, 20 March 1918, under the authority conferred upon him by the Naval Bill of 1917, «in exercise of our indisputable rights and in accordance with the law and practice of nations,» 68 ships, representing about 470,000 tons, belonging to Holland, lying in United States ports, were confiscated. The seizure was condemned by Germany and also in other quarters, as in Holland, as a violation of the rules of international law. It has been vigorously defended, however, as lawful by eminent jurists and justified by the law of *angaria* or *angary*, long recognized in legal usage, as stated above, and also as incorporated in The Hague conventions of 1899 and 1907. At about the same time Great Britain, claiming under the same right, took control of a number of Dutch ships representing about 400,000 tonnage.

CONFISCATION ACT OF 1861, a United States statute «to confiscate property used for insurrectionary purposes.» See CONFISCATION.

CONFUCIUS, kŏn-fū'shi-ŭs (Latinized form of Chinese K'ung-futze, the Master Kung), Chinese philosopher: b. province of Shan-tung, about 551 B.C.; d. in Lu, 478 B.C. His father, Kung Shuh-liang-heh, who was of royal descent, died three years later, and the boy was reared in comparative poverty by his mother, Ching-tsai. At the age of 17 he was made inspector of corn-markets, keeper of granaries and overseer of public fields. Here he made such a good record that he gained the favor of the governor. At 19 he married, and some four years later he began his career as a teacher. By 520 he had worked out the general direction of his philosophy from which he departed very little thereafter. The disregard for the moral law then prevalent in the province of Lu induced him to make a study of the ancient writings of China. At the age of 22 he had already become a well-known teacher and expounder of the ancient writings, and many noted persons gathered at his house to gain instruction from him. He had no intention of teaching a new religion or philosophy. He aimed to bring men to a realization of the utility, beauty and truth of the old. He bent all his energies to reviving old customs; and in this he set a fashion still strong in China to-day. In 517 B.C. he was induced, by two members of one of the principal houses in Lu who had joined his band of disciples, to visit the capital with them, where he had interviews with Lao-tze, the founder of Taoism. Though temporarily driven from Lu to Tsi by a revolution, he soon returned thither with an increasing following; and there he remained for 15 years, during which he kept constantly in view his mission as a philosophical teacher. At the age of 52 he was made chief magistrate of the city of Chung-too. So striking a reformation was effected by him that he was chosen for higher posts, became minister of crime, and with the aid of two powerful disciples, elevated the state of Lu to a leading position in the kingdom. Through the political intrigues of the governors of neighboring states Confucius was removed from office (496 B.C.), and became a wanderer in many parts of China for 13 years.

In 485 he returned to Lu, but would not take office. The death of his favorite disciples, Yen Hwin and Tze-lu, in 481 and 478, did much to further his own, which took place in the latter year. Confucius left no work detailing his moral and social system. His five canonical books 'Yih-king'; the 'Shu-king'; the 'Shi-king'; the 'Le-king'; and the 'Chun-tsien' are grouped with the 'Four Books,' by his disciples, the 'Ta-hëo or Great Study'; the 'Chung-yung or Invariable Mean'; the 'Tun-yu or Philosophical Dialogues'; and the 'hi-tse,' written by Meng-tse or Mencius. (Consult 'Sacred Books of the East'). The teaching of Confucius has had, and still has, an immense influence in China, though he can hardly be said to have founded a religion or a philosophy. All his teaching was devoted to practical morality and to the duties of man in this world in relation to his fellowmen. In it was summed up the wisdom acquired by his own insight and experience, and that derived from the teaching of the sages of antiquity. He sought to attain a happy tranquillity throughout the Chinese Empire which could, he believed, be attained by the observance of the five obligations of human society: Those between sovereign and minister; father and son; husband and wife; elder and younger brother; and between friends. It was, according to his teaching, incumbent upon all to perform the reciprocal duties arising from each relationship. In his teachings there is a strong feudal leaning which advocates almost unlimited authority for the sovereign over the minister; for the father over the son; the husband over the wife; the elder brother over the younger. Subordination to superiors he looked upon as one of the greatest of all essentials for the existence and proper conduct of the state. To these must be added virtuous conduct among all and upright dealing among friends. The education of the young he declared to be the foundation of the welfare of the state. Democracy had not yet made its appearance in China and Confucius' ideal of government was a paternal despotism wisely and honestly directed and administered. This position he modified by the assertion that a ruler's maintenance of power should depend upon his just and upright conduct and his honest endeavor to make his government good.

His philosophy is not deep, but its general tendency is good, affecting strongly the usual intercourses of life. It is thoroughly practical and terrestrial, and it avoids theology and metaphysics and all those subjects that Confucius could not make clear by example and apply rigidly as rules of life. He never attempted to solve questions that he considered beyond his reach. Fast and hard rules of morality and action he made to govern the intercourse of the human race; and in this sense he tied China to a system for hundreds of years. He occupied himself altogether with the problems of this world and let the next take care of itself. From the Christian point of view, therefore, there is nothing spiritual about the work of Confucius. His attitude toward spiritual questions he has put clearly upon record: "To give one's self up earnestly to the duties incumbent upon men and, while respecting spiritual beings, to keep aloof from them, may be considered wisdom." His teachings have left China more materialistic and less spiritual than is any of the other great nations. While he instilled morality and national and individual honesty, yet more than 24 centuries of his teachings have not driven superstition and ignorance out of the land, nor improved the government, nor raised the condition of the masses of the people, nor driven illiteracy out of the nation. They have retarded the progress of democracy in a people, in spirit, essentially democratic, and they have encased the national spirit in a hard shell of rules and conventionality from which it has just begun to make spasmodic efforts to free itself. The thinking people have, however, begun to realize dimly that his philosophy is, in many ways, unsuited to an age in which the spirit of all progressive government is expressed by the will of the people. Since the overthrow of the monarchy, candidates for public offices are no longer required as formerly to pass a rigid examination in the "nine classics." As the teachings of Confucius gave their strong sanction and support to the despotic form of government which ruled China, almost uninterruptedly for more than 30 centuries, the royal family and the nobility naturally gave to it an importance that it did not intrinsically possess. They saw to it that there were magnificent shrines erected to Confucius in every city, town and community throughout the Chinese Empire, and that his priests were specially honored, so that they became one of the mightiest forces in the direction of the life of China. However honest they may have been in the fulfilment of their great duties and obligations, they have hung upon the chariot wheels of progress.

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JOHN HUBERT CORNYN,
Editorial Staff of the Americana.

CONFUSION (Lat. *confusio,* "a mixing together"), the act of confusing or mingling together two or more things or notions that are properly separate. (1) In mental diseases acute confusion occurs in the early stages of general paralysis, in acute mania, in melancholia, in dementia præcox, and in most of the insanities. It might be called an initial symptom of insanity. The characteristic symptoms are lack of correct appreciation of external expressions, loss of continuity of thought, with a certain enfeeblement of judgment. There are certain insanities characterized purely by acute confusion. See INSANITY.

(2) Confusion is used, in a legal sense, in civil law, to signify the merger of two titles in the same person. In both civil law and Scots law it implies the extinction of an obligation or servitude through the fact that the two parties whose divided position is necessary for the continuance of the debt or obligation become one person. This might happen when one of them became the heir of the other for instance.

CONGÉ D'ÉLIRE, kôṅ-zhä-dā-lēr (Fr. "leave to elect"), in England, the sovereign's warrant authorizing the dean and chapter of a vacant see to proceed with a new election. The nomination to bishoprics, originally understood to have been vested in the Christian people, who made it by election, was afterward transferred to the sovereigns of most states, and remained with them till the 11th century, when, with the assistance of the Pope, it was wrested from them and conferred upon the clergy. In England, the Constitutions of Clarendon, in 1164, conferred the election on the chapters, and this right was formally confirmed by Magna Charta, subject, however, to a right in the sovereign to grant a *congé d'élire,* and also to confirm the chapter's choice. Thus matters remained till the Reformation, when the Crown made a very important encroachment, and provided by 25 Henry VIII c. 20, that though the dean and chapter were still required to go through the form of an election, the person to be chosen should previously be absolutely fixed by the sovereign. This act is still the regulating statute, and not only provides that on every vacancy in a see the sovereign may grant a license to proceed to the election of a successor, and with it a letter containing the name of the person to be elected, but that, if the dean and chapter delay the election beyond 12 days or elect any other person than the one named in the letter, or do anything else in contravention of the act, they incur the penalties of a *præmunire,* that is, forfeiture of goods, deprivation of certain civil rights and imprisonment. Any bishop or archbishop neglecting to assist at the consecration and investment of the bishop-elect, within 20 days after the legal announcement of his election, is liable also to the penalties of *præmunire.*

CONGENITAL DISEASE, a disease which the new-born child inherits from its father or mother, or it may be its grandparents. Syphilis, gout, congenital anomalies such as hare-lip, web fingers and toes, etc., are among the few truly congenital diseases. During child-birth children may acquire infections, but these are not truly congenital diseases. It is often very difficult to tell whether a child becomes diseased in the parturient canal of the mother, at the time of birth, or through accident, or through contact with the mother following birth. See CHILDREN, DISEASES OF.

CONGER, kŏn'gėr, **Edwin Hurd,** American diplomatist: b. Knox County, Ill., 7 March 1843; d. Pasadena, Cal., 18 May 1907. He was graduated at Lombard University in 1862, served in the Union army 1862–65, was graduated at the Albany Law School in 1866, and was elected to Congress in 1884 and twice re-elected as a Republican. He was Minister to Brazil (1890–98), and then to China. He was at his post throughout the Chinese crisis of 1900, in Peking, being imprisoned with his family and the entire diplomatic corps in the British legation from 20 June to 15 August. His rescue on 20 August was effected by the allied powers barely in time to save him and his colleagues from a general massacre. He was appointed Ambassador to Mexico early in 1905 but resigned in August of that year.

CONGER EEL, a species of marine eel (*Leptocephalus conger*) with a long dorsal fin reaching forward nearly to the head and continuous posteriorly with the caudal; the pectoral fins present; strong, close-set teeth in the jaws; mouth and eyes large, and scales absent. The conger is a large eel, the ordinary specimens commonly captured along the New England shores being four feet long, while those taken in the open sea are six to eight feet, and weigh 50 to 60 pounds, and, in rare cases, upward of 100 pounds. Very little is known of their habits in the natural state, but they are easily kept in aquaria and are known to be ravenous creatures, which devour fishes, crustaceans and mollusks, and even the smaller members of their own species. From observations made on specimens in captivity in England Dr. Cunningham has concluded that, as in many other fishes, spawning takes place but once; the females, upon the approach of that period, ceasing to feed and undergoing degenerative changes in respect to the skeleton and other parts. Spawning occurs in the deep sea and during development a transparent band-like larva is formed which was long ago described as a distinct genus under the name of *Leptocephalus.* The conger is a prolific fish, producing about 3,000,000 eggs. After nightfall the conger eel may be induced to take the hook and affords good sport.

CONGESTION (Lat. *congestio,* "accumulation"), an abnormal amount of blood in the vessels which is caused by pressure on the arteries or by obstruction to the emptying of the veins. It is usually due to some acute inflammatory reaction, causing rapidity of the heart beat or dilatation of the blood vessels with consequent congestion in some area. In venous congestion, as a rule, the cause is due to some constriction of the venous return to the heart. Congestion is present during many diseases, and may be caused temporarily by over exertion, drugs, intoxication or a severe blow, fall or cold. See Cold.

CONGLETON, England, a market town and borough of Cheshire, in a deep valley, on the Dane, 26 miles south of Manchester. Among the chief buildings are the town hall and the grammar-school. Congleton is a seat of the silk manufacture, ribbons, handerchiefs, and other articles being made; it also carries on fustian-cutting, the manufacture of agricultural implements, rope-making, brewing, etc. Near it are collieries and quarries, and salt is abundant in the neighborhood. Pop. 11,309.

CONGLOMERATE (Lat. *conglomeratus*, «rolled together»), or **PUDDING-STONE,** a firm sedimentary rock made up of rounded detrital pebbles and even boulders, the interstices usually filled with sand or other fine-grained rock material. Silica is the commonest cementing material, calcite and limonite coming next. The pebbles and boulders may be of any kind of rock, though quartz and quartzite are the most frequent, since the most resistant material in gravels. According to the character of the pebbles, different names are given, as quartz conglomerate, limestone conglomerate, etc. Conglomerates grade through pebbly sands and sandstones into true sands and sandstones. Under dynamic stress, in the folding of rock strata, the pebbles of a conglomerate may be much distorted, and by further metamorphism a conglomerate may pass into a gneiss. Some notable conglomerates are the copper-bearing Calumet and Hecla conglomerate on the Keweenaw Peninsula, Michigan, of Algonkian Age; the great conglomerate at the base of the coal measures of Carboniferous Age, in Pennsylvania and adjacent States; the Roxbury conglomerate of uncertain age, near Boston, Mass.; and the famous «banket,» possibly of Permian Age, on which are located the great gold mines of the Transvaal. See Breccia; Gneiss; Rock; Sandstone.

CONGO. See Kongo.

CONGO FREE STATE. See Kongo.

CONGO SNAKE. See Kongo Snake.

CONGREGATION (Fr. *congregation*, Lat. *congregatio*, from *congregare*, «to come together in a body»), a gathering or collection of persons; usually a religious assembly; in its most ordinary use, an assembly of Christians met in one place for worship. (1) In the Roman Catholic Church, it often designates a sort of board of cardinals, prelates and divines, to which is entrusted the management of some important branch of the affairs of the Church. Thus the Congregation of the Index examines books and decides on their fitness for general perusal. The *Congregatio de Propaganda Fide* is instituted for the propagation of the Roman Catholic faith and the government of the Church in non-Catholic countries. The Congregation of Relics inquires into the genuineness of supposed relics. The Congregation of the Holy Office takes cognizance of heresies, etc. The Congregation of Rites regulates the festivals and offices of new saints. There are numerous other Congregations. The word is also used in the Roman Catholic Church to describe communities of ecclesiastics who live together under rule, but without being bound by vow, or at least by solemn vow. Such are the Congregation of the Oratory, the Congregation of the Most Holy Redeemer, usually called Redemptorists, etc. See Congregation of Our Lady of Calvary; Congregation of the Mother of God; Free Congregations.

(2) In the Old Testament, congregation has the religious sense of the whole body of the Hebrew people gathered together and set apart for the service of God; while in the Christian Church it bears both the older meaning of the Church in general and also that of an assembly of worshippers, in a restricted sense.

(3) Congregation was also the name given to the Protestant Reformers in England during the reign of Mary.

CONGREGATION OF BISHOPS: CONGREGATION OF THE CONSISTORY, etc. See Congregations, The Sacred.

CONGREGATION OF OUR LADY OF CALVARY. A French order of Benedictine nuns, which had a somewhat stormy career. Organized at Poitiers in the early part of the 17th century, the Society, after having played an important part in the religious life of France, was broken up during the Revolution and its members dispersed over the face of Europe. The order was reorganized and again secured a firm footing in the land of its birth. See Congregation.

CONGREGATION OF THE MOTHER OF GOD. A monastic order instituted at Lucca, Tuscany, about 1574 by Giovanni Leonardi. It was originally known as Clerks Secular of the Blessed Virgin, and later, while Leonardi was still alive, as Clerks Regular of the Blessed Virgin, a name it kept until the Society was suppressed in 1867. The former residence of the clerks, who also kept a large, flourishing and famous boys' school, is now the Public Library of Lucca. On its reorganization the Society was known popularly as the Congregation of the Mother of God.

CONGREGATIONAL EDUCATION SOCIETY, a body incorporated at Boston 1816, for the purpose of educating youths for the gospel ministry. After changing its name several times, in order to cover the scope of its work in secondary and missionary schools, it finally adopted the name it now holds and included in its purpose, not only the support of students, but of all schools of Christian teaching.

CONGREGATIONAL METHODIST CHURCH, an ecclesiastical body in the United States, organized in Monroe County, Ga., by seceders, lay and clerical, from the Methodist Episcopal Church, in 1852. The movement was in the direction of a more democratic or congregational polity, designed to give the members of individual churches larger and more direct control of their own affairs; but the body still preserves the more essential forms of organization and procedure, such as the conference system, etc., characteristic of the Methodist Episcopal Church. It has a membership of over 20,000 distributed among about 350 churches.

CONGREGATIONALISM had its origin in an attempt in England to carry the principles of the Protestant Reformation regarding the authority of Scripture to their radical consequences. Accepting the Bible as the sole rule of faith and practice, the founders of Congregationalism sought to find in it not merely an authoritative source of Christian doctrine; but, also, a complete, adequate and binding pattern of church government and organization. They grew out of the Puritan party of the reign of Queen Elizabeth, of which party they were the most advanced wing. They shared fully the intense Calvinism of that party and differed from it only in matters affecting church organization and government. The great majority of the Puritans held to the conception of a national Church, of which all baptized and non-excommunicated inhabitants of the kingdom were members. The reformation of this Church, though earnestly to be sought by private Christians, they viewed as ultimately the work of the national government, and hence they held it to be a duty to remain in the Church of England, while laboring for what seemed to them its betterment. This reformation involved, in the conception of the Puritans generally, the establishment everywhere of a learned, earnest, preaching ministry; of efficient discipline; of what they deemed a more scriptural organization of the Church; and the disuse of such vestments and forms of worship as seemed to them to be without biblical authority or to savor too strongly of Roman usages.

The founders of Congregationalism sympathized with these aims and criticisms of the Puritans, but, unlike the majority of that party, they believed that the reforms which they desired in the Church of England should come about through individual initiative, by the separation from that Church of those who criticised it. Hence the early Congregationalists of England were called «Separatists.» They rejected the thought of a national Church. They held that the only proper form of the visible Church is the local congregation, composed of a company of professed disciples of Christ who can claim personal religious experience, and are united to Christ and to one another by a voluntary covenant which transforms a company of Christians into a Church. Of these congregations Christ is the immediate head. Each, they conceived, is completely self-governing, choosing its own officers and administering its own discipline. While no earthly authority outside of such a Church has jurisdiction over it, each such congregation owes advice and aid to its sister congregations as necessity may require. This mutual responsibility and helpfulness has always led American Congregationalists to reject the name «Independent» which is popularly attached to the churches of this order in Great Britain. The officers of such a local Church were conceived by the founders of Congregationalism, following what they thought the New Testament model, to be a «pastor,» and a «teacher» who should preach and administer the sacraments; a «ruling elder» who should aid the «pastor» and «teacher» in the administration of discipline; «deacons» to administer the financial affairs and charities of the congregation, and «widows» to care for those in illness and the poor. In their revolt from the prescribed liturgy of the Church of England they held that public prayer should be wholly free; and, like the Calvinists generally, they gave the chief place in public worship to the sermon.

Though Richard Fitz and his associates, whose congregation at London was broken up by the English government in 1567, may be deemed the earliest organized Congregationalists, the first clear presentation of Congregational principles was made in the works of Robert Browne, a graduate of the University of Cambridge in 1572, who passed from Puritanism to Separatism, probably in 1579, organized a church at Norwich in 1580 or 1581, and issued a series of tracts in defense of his views, from his exile at Middleburg in Holland, in 1582. Though Browne not long after conformed to the Church of England, a similar work was taken up by others, notably by Henry Barrowe, a lawyer of London, and Rev. John Greenwood and Rev. Francis Johnson in the same city, where a Congregational church was organized in 1592. In 1593 Barrowe, Greenwood and Rev. John Penry were hanged at London for opposing the ecclesiastical authority of Queen Elizabeth, and the Church in London was driven into exile. It found a refuge in Amsterdam under the pastoral care of Francis Johnson and Henry Ainsworth.

Contemporaneously with the later of these events, an apparently independent movement in the vicinity of Gainsborough and Scrooby, led at first by William Brewster, the postmaster at Scrooby, Rev. Richard Clyfton, rector at Babworth, and later also by Rev. John Robinson and Rev. John Smyth, resulted in the organization, about 1606, of congregations at Scrooby and Gainsborough, which were compelled to seek refuge speedily in Holland. That of Scrooby settled, in 1609, at Leyden under the pastoral care of Robinson, and a portion of this congregation, led by William Brewster, William Bradford and Edward Winslow, crossed the Atlantic in the *Mayflower*, and laid the foundations of Plymouth Colony in 1620, thus establishing the first of the Congregational colonies in America.

The settlers of Plymouth were Separatists, but during the years immediately succeeding their establishment in the New World, the course of politics in England under James I and Charles I was such as to lead many of the Puritans to despair of the attainment of the reforms they desired in Church and State in the home land. The consequence was a large Puritan emigration across the Atlantic; and the establishment, in the course of a decade (1628–38), of the three Congregational colonies of Massachusetts Bay, Connecticut and New Haven. These Puritan settlers were all led by the radical development of their own principles in a new environment, and the influence of Plymouth example, to establish churches on the Congregational model, at their settlement in New England.

These colonies differed slightly from one another in the degree in which they applied theocratic principles to the organization of the State. In Massachusetts from 1631 to 1664, and in New Haven from 1639 to 1665, when New Haven was absorbed in the Connecticut Colony, the franchise was confined to church members. In Connecticut and Plymouth colonies no such restriction existed. Doctrinal discussion aroused by Mrs. Anne Hutchinson and her adherents at Boston occasioned the meeting of the first «Synod» or council representative of the Congregational churches of New England, in 1637. At the Cambridge Synod in 1648, these churches, by their pastors and delegates there assembled, adopted the «Cambridge Platform» as a compact manual expressive of their views of the organization, officers and discipline of the churches. The first century of New England Congregationalism saw, however, little theological debate, for the New England churches stood on the common doctrinal ground of Calvinistic Puritanism. The chief controversy of this period was that regarding church membership known as the «Half Way Covenant» discussion. In the view of the founders of Congregationalism the reception of a parent to church membership by «owning the covenant» involved the admission into church membership of his immature children. But adult membership implied experimental Christian character. When the children of the first settlers began to grow to maturity the question of their status forced itself, therefore, on the attention of the churches. A ministerial convention, representative of Massachusetts and Connecticut, held at Boston in 1657, and a «Synod» of the Massachusetts churches convened in 1662, decided that such as were church members in childhood by reason of their parents' membership could, when they in turn became parents, bring their children to baptism, and could confer upon such children the same degree of membership which they themselves possessed; but unless consciously and personally of Christian experience could not vote on ecclesiastical questions or partake of the Lord's Supper. Hence a distinction between members in «full communion» and in «half way covenant» was made, which continued till early in the 19th century, when it disappeared, largely owing to the opposition which Jonathan Edwards and his disciples had manifested to it from 1749 onward.

Congregationalism, like the Calvinistic churches in general, believed in the necessity of education, and therefore the New England colonies speedily after their foundation established schools, and planted Harvard College in 1636. Yale College followed in 1701. This spirit has characterized Congregationalism throughout its history and has led Congregationalists to be pre-eminently founders of schools and colleges as they have extended westward in the United States. The elaborate system of church officers already described, and believed by the founders of Congregationalism to be scriptural, outlasted the first generation of the settlers of New England in only a few instances. While they existed «pastor,» «teacher» and «ruling elder» all received salaries from the churches they served; but in most of the New England churches «teachers» and «ruling elders» soon disappeared, leaving only a pastor and a variable number of deacons. The more modern growth of organization and methods of Christian work has led to the establishment of other officers, such as a clerk, a treasurer, a Sunday-school superintendent, and often one or more standing committees, and no feeling now exists that officers should be limited to those mentioned in the New Testament as possessed by the early Church. The pastor remains, with rare exceptions, the only salaried officer. The support of public worship which was originally by voluntary gifts, and has always been so in Great Britain, became, between 1638 and 1655, a matter of public taxation in all the Congregational colonies. In Connecticut this relation to the State which made Congregationalism practically a State-supported Church lasted till 1818, and in Massachusetts till 1834; but since the latter date Congregationalism has nowhere enjoyed State aid.

The high-wrought spiritual impulse manifested by the first settlers of New England was followed by a period of decreasing religious interest affecting the second, third and fourth generations on New England soil. This condition was terminated by a series of «revivals,» of which the first manifestation was in that at Northampton, Mass., under the pastorate of Rev. Jonathan Edwards in 1734, and of which the culminating expression was witnessed in the two years following the preaching tour of Rev. George Whitefield in 1740. This spiritual quickening is known as the «Great Awakening,» and undoubtedly added many to the membership of the churches. It was marked, however, by much excitement, and was followed by a period of spiritual decline lasting through the troubled years of public conflict and debate which ended with the adoption of the Constitution of the United States. It resulted in serious controversy in the churches of New England as to its merits, those who opposed it as on the whole harmful being called «Old Lights» while those who favored it were nicknamed «New Lights.» In the teachings of Jonathan Edwards (1703–58) a theological movement of importance in American religious history began; and the modified Calvinism of the Edwardean school was further developed by Joseph Bellamy (1719–90), Samuel Hopkins (1721–1803), the younger Jonathan Edwards (1745–1801), Timothy Dwight (1752–1817), and Nathanael Emmons (1745–1840) into a distinctive New England theology. In eastern Massachusetts, on the other hand a «liberal» school arose before the American Revolution, which grew slowly and was made clearly evident in the Unitarian separation of the early years of the 19th century — a separation that had its most conspicuous manifestation in the adhesion of Harvard College to the «liberal» side in 1805, though the full significance of the division was not apparent until 10 years later.

With the decade beginning in 1791, the Congregational churches of New England experienced a series of revivals which were repeated at intervals until 1858. Under these impulses not only was the membership of the churches much enlarged, but a rapid development of agencies for missionary evangelization and religious education took place. The churches of Connecticut, which had already done home missionary work in Vermont and New York for more than 20 years, organized their «General Association» in 1798 as the «Missionary Society of Connecticut.» A missionary society was formed in Massachusetts in 1799. In 1801 the «New Hampshire Missionary Society» was inaugurated, and in 1807 a similar organization was effected in Vermont. These societies were chiefly engaged in home missions in the then Western States and Territories, though some work was done by them among the Indians; but in 1810, the «American Board of Commissioners for Foreign Missions» came into being and enlisted the activities of the Congregational churches in evangelization abroad. This society was followed, in 1815, by the formation of what is now known as the «Congregational Education Society» for assisting ministerial candidates and institutions of learning. In 1826 an «American Home Missionary Society,» now known as the «Congregational Home Missionary Society» was organized to undertake home missionary work. These were followed later by the formation of the «American Missionary Association,» in 1846, for labor, especially, among the negroes and Indians of the United States — a society which has done a large missionary and educational work in the South since the Civil War. In 1853, the «Congregational Church Building Society» came into being, under the title of the «American Congregational Union» — an organization the work of which is sufficiently described by its more recent name. All these societies still exist and serve as agencies for the missionary activities of the Congregational churches of the United States. By the action of the «National Council» of 1913, ratified by these societies, the voting membership of the council are voting members of each of these «national» societies, which are then brought into direct relations to the churches. A considerable consolidation of these societies has been planned but the details have not been fully worked out.

Contemporary with this awakening of missionary activity and immediately consequent upon the passage of Harvard University to the «liberal» side occurred an extensive development of theological education, beginning with the opening of Andover Theological Seminary in 1808. Bangor Theological Seminary was founded in 1816; and, in 1822, the theological department of Yale University was organized. Local disputes in Connecticut growing out of the modified type of Edwardean theology presented by Prof. Nathaniel W. Taylor of Yale led to the organization in 1834 of what is now known as «Hartford Theological Seminary.» The theological department of Oberlin College came into existence in 1835, and the westward growth of the denomination brought about the opening of «Chicago Theological Seminary» in 1858, and of «Pacific Theological Seminary,» now at Berkeley, Cal., in 1869. The latest school for ministerial training is that opened at Atlanta, Ga., in 1901. These eight theological seminaries are the principal agencies for the training of the ministry of the Congregational churches of the United States. The Congregationalists of Canada have a seat of ministerial education in the «Congregational College of Canada,» established in 1830, and now affiliated with McGill University at Montreal. In Great Britain no less than 11 Congregational «colleges» do a work similar to that of the «theological seminaries» on this side of the Atlantic.

To the close of the 18th century the Congregational churches of the United States were practically confined to New England; and, in the subsequent westward extension of New England emigration, Congregationalism and Presbyterianism long worked together in the formation of churches in the newer States under the so-called «Plan of Union» of 1801. This «Plan» was repudiated by the «Old School» wing of the Presbyterian body in 1837, and by the Congregational churches, through the «Albany Convention,» in 1852. Congregationalism has now extended in force to those parts of the United States, especially, which have been settled through New England emigration. Throughout the latter half of the 19th century, the Congregational churches of the United States have felt an increasing denominational consciousness, which has found its expression, among other ways, in the gathering of bodies representative of these churches as a whole. A «Convention» met at Albany in 1852, a «National Council» at Boston in 1865, and since 1871 a «National Council» has met every three years. In 1913, by a new constitution then adopted, its sessions became biennial. Besides this «National Council» in which delegates of the churches of the United States are regularly assembled, the churches of each State are represented in an annual «Conference»; and the churches of smaller districts, usually counties, meet in more local «Associations.» None of these bodies are in any sense courts of discipline, but they gather for deliberation, consultation and joint action by committees, or otherwise, in matters of common concern.

Each Congregational church is a self-governing body, capable of choosing its own officers, expressing its creed in such forms as seem best to it, determining the conditions for the admission of its members, and ordering its public worship as it deems most fitting. But while a Congregational church is a self-governing democracy, Congregationalism, always in the United States, and increasingly in Great Britain, has insisted that its churches are knit together in sisterly fellowship, and owe, therefore, to one another, advice in all matters of importance, discipline in evident error and mutual helpfulness. Hence in questions of serious ecclesiastical concern such as the settlement or dismissal of a pastor, the management of a case of discipline which the local church finds it impossible to handle, the organization of a new church, and the like, Congregational usage in the United States, though not in Great Britain, requires the summons of an «advisory council» composed of a variable number of churches, chiefly from the vicinity, which are represented in the council by their pastors and a delegate each. These councils oftentimes also include a few individuals summoned by name as experts in the matter under consideration. By such an «advisory council,» met for the particular occasion, advice is given; and, though this advice is not obligatory, it is seldom that the opinion of such a council is disregarded.

Membership in a Congregational church is conditioned on the vote of the local church itself, in view of the candidate's profession of faith in Christ, evident determination to live a Christian life and acceptance of the covenant obligations of Christian service in connection with the local company of Christian disciples of which he desires to become a member. While all matters of concern in a local congregation are determined, ultimately, by the votes of the membership, Congregational churches transact their business chiefly through the use of committees, and a standing «prudential committee» to assist the pastor and deacons is appointed in most churches of numerous membership.

But while each church is thus free to establish such a test of the faith of candidates for its membership as it deems proper, Congregationalists in representative assemblies or in a more informal way have always been ready to testify to their faith of public creed declarations. Examples of such witness-bearing have been the approval of the doctrinal portion of the Westminster Confession by the New England churches by the Cambridge Synod in 1648; the modification of that confession by delegates of the English churches gathered at the «Savoy,» London, in 1658, and its publication as the «Savoy Declaration»; and the substantial confirmation of this «Declaration» by the churches of Massachusetts in 1680, and of Connecticut in 1708. Later examples of the same readiness of Congregationalists to witness to their beliefs is seen in the «Principles of Religion» adopted by the «Congregational Union of England and Wales» in 1833; the «Burial Hill Declaration» approved by the «National Council» of the United States in 1865; the «Commission Creed» issued by a committee of the same American body in 1883 and the brief statement of faith and polity prefixed to the constitution adopted by the National Council which met at Kansas City in 1913. All of these statements have been regarded, however, as testimonies rather than as tests of ministerial fitness or church-fellowship.

Aside from its representation in the United States, Congregationalism is strongly entrenched in Great Britain, where its adherents are often known by the name «Independents.» The churches of this order in Great Britain are grouped together in county and district «Unions» and «Associations» and are represented in the «Congregational Union of England and Wales» and the «Congregational Union of Scotland.» In general, however, the Congregational churches of Great Britain have emphasized mutual accountability and organization into representative bodies much less than those of the United States. Congregationalism is creditably represented in the Dominion of Canada and in Austria, as well as on missionary soil, where the two extensive Congregational missionary agencies, the «American Board,» and the «London Missionary Society,» have labored. An «International Council,» representative of all lands in which Congregationalism has found a home, held its first session at London in 1891, its second at Boston in 1899 and its third at Edinburgh in 1908.

Congregationalists in foreign countries numbered 666,669 on 1 Jan. 1914, of whom by far the larger number are in the British Isles. There are:

In England and Wales	453,457
" Scotland	35,666
" South Africa	22,427
" Japan	16,105

and the rest in other countries.

The Congregationalists of the United States reckoned their communicants at 763,182 in 1915, with 6,093 churches and 5,923 ministers. The enrolment in Congregational Sunday-schools of the United States in 1915 was 757,873. The home expenses of the churches of the United States for the year 1914 were $10,716,311; their benevolent contributions in 1914 were $2,272,040.

The «American Board of Commissioners for Foreign Missions» by which the missionary work of Congregational churches of the United States is carried on reported the following statistics for the year 1915: Mission stations, 103; out stations, 1,458; American missionaries, 656; native laborers, 4,777; churches, 676; communicants (members), 80,844, of whom 5,834 had been added during the previous 12 months. The «London Missionary Society,» through which the foreign work of the churches of Great Britain is chiefly carried on, reported, during the same period, 1,730 stations and out stations, 480 missionaries, 6,987 native laborers and a church membership of 82,319, of whom 4,000 had been added the previous year.

While the title «Congregational» designates a particular fellowship of churches, or religious denomination, in the United States and Great Britain, the Congregational form of church organization, especially in its aspect of the self-government of the local congregation, is that of many other religious bodies, notably of the Baptists, the Christians, the Unitarians and of certain branches of the Adventists, and Lutherans, so that the Congregational polity is much more widely extended than the adherents of the churches which officially or popularly bear the Congregational name.

Williston Walker,
Professor of Church History, Yale University.

CONGREGATIONS, Religious, communities or orders, bound together by a common rule either without vows or with solemn vows. In France the name is so used as to include associations or confraternities of the laity. A group of monasteries is sometimes called a Congregation, when they unite themselves closely by ties of government and discipline and by similarity of rule. The Cassinese congregations of Benedictines and the Congregation of Cluny are examples. The Roman Catholic Church uses the term to designate a committee of cardinals entrusted with a department of Church affairs, such as the «Congregation of Rites,» which regulates the festivals and offices of new saints.

CONGREGATIONS, The Sacred. A Congregation is a college or corporation of the Catholic Church consisting of a certain number of Cardinals, for taking charge of, discussing and deciding matters which belong to certain particular branches of business. The primacy of the Roman Pontiff of its very nature demands that his counsellors and assistants should be selected throughout the world from among those who have personal knowledge and experience of places and persons in cases submitted for examination or judgment.

To this fact councils owe their origin. They did not, however, suffice. The need of a permanent body at the side of the Pope was felt to be opportune. Thus the College of Cardinals arose. When all the Cardinals were convoked in presence of the Pope to deliberate on a particular point or to transact an affair of importance, this Convocation was called a Consistory. From this Consistory of Cardinals the Roman Congregations took their origin.

The chief author of the Sacred Congregations was Sixtus V. He arranged all the ecclesiastical affairs in a certain system and distributed them among 15 different congregations. Afterward Clement VIII, Gregory XV, Urban VIII, Clement IX and Pius VII added other congregations. They are divided into Ordinary and Extraordinary ones according as they are permanent or constituted only for a time.

The congregations consist of Cardinals, only one of whom holds the office of Prefect unless the Holy Father reserves that prefecture for himself. As Secretary, usually a titular Archbishop is appointed. In order that the decisions of the Congregations be valid it is necessary that not fewer than three Cardinals make up each Congregation, unless the Pope by a special indult grants that a less number suffice.

The power of each Congregation is limited to the matters assigned to it by the Pope, and the sphere of its jurisdiction extends over the whole Church.

The form of procedure varies according to the nature of the Congregations, the scope of power that is exercised and the diversity of the cases presented for deliberation or settlement. Routine matters of no great moment and which are extrajudicial may be settled bv the Secretary or the Prefect; while serious questions and judicial causes are laid before the whole Congregation and moreover must be brought to the personal attention of the Pope.

The decisions of the Congregations on the questions proposed are usually given in the simplest forms — for example, «Affirmative» or «Negative.»

There can be no true appeal from the sentences of the Sacred Congregations as they are the decisions of the highest tribunals. However, a new hearing may be asked and obtained.

The Roman Congregations are the following:

1. Congregation of the Consistory.

This Congregation is the solemn gathering of the whole college of Cardinals present in the Curia and assembling before the Pope for consultation and definition of certain most important ecclesiastical affairs. The Consistory is of two kinds, Public and Secret.

According to the present discipline only certain solemn acts are now performed in the Public Consistory, such as the giving of the red hat to the new Cardinals after they have been appointed in the Secret Consistory. In the Secret Consistory are made the promotions to the Cardinalate; appointments of bishops and their transfer from one diocese to another; the granting of Pallia; creation, division and union of diocese; selection of delegates «a latere» and of coadjutor bishops; solemn allocutions about the most important Church matters, and in general consultations about affairs that are of most serious moment.

The Congregation of the Consistory has ordinarily the Pope for its prefect and consists of from 8 to 12 Cardinals. Its secretary is the same as that of the Sacred College of Cardinals.

Annexed to this Congregation is the Congregation for the Examination of Bishops which was instituted by Gregory XIV. Its duties, however, to a large extent, are now performed by the Special Congregation for the appointment of archbishops and bishops, which was first instituted by Benedict XIV and restored by Leo XIII on 21 Sept. 1878.

2. Congregation of the Holy Office. (See INQUISITION).

3. Congregation of the Index of Prohibited Books. (See INDEX).

4. Congregation of the Council (*Interpretum concilii Tridentini*).

The Council of Trent in its twenty-fifth session solemnly declared its confidence in the efforts of the Roman Pontiff to remove by opportune declarations and remedies any difficulties or doubts arising from its Tridentine Decrees. Hence Pius IV instituted a congregation of eight Cardinals to look after the execution and observance of the Council's decrees. Pius V and Sixtus V enlarged the faculties of the Congregation. Its duties now lie in the interpreting of disciplinary decrees of the Council of Trent and in the taking of measures regarding the observance of these decrees, and finally it has the power of judging in causes which are implicitly or explicitly contained in these decrees. It has a Prefect, a Secretary, an assistant secretary, and an auditor and several consultors.

Joined to the Congregations of the Council are:

a. The Special Congregation upon the State of Churches.

b. The Special Congregation upon the Revision of Provincial Synods.

c. The Special Congregation upon the Residence of Bishops.

d. The Congregation of Ecclesiastical Jurisdiction and Immunity.

5. Congregation of the Affairs of Religious, or of Bishops and Regulars.

This Congregation owes its origin chiefly to Sixtus V. Its special duty is to settle affairs which concern bishops and regulars. Hence it has competency in all cases which regard the proper administration of dioceses by their bishops, excepting only those cases which require an interpretation of the Council of Trent. It receives appeals made to the Apostolic See against bishops, etc.; replies to difficulties which may arise in the administration of a diocese; examines, approves or disapproves the alienation of Church property, etc. It settles contentions which arise between different religious orders; examines complaints caused by the election of a superior-general or other superiors or by their administration. In a word this Congregation has competency in all that regards the proper rule and direction of religious orders in the Church. It is constituted upon similar lines to the other Congregations, having a Prefect, Secretary, etc. Annexed to it also are two Special Congregations, namely:

a. The Congregation for Discipline of Regulars, established by Innocent XII.

b. The Congregation of the State of Regular Orders.

6. Congregations of Sacred Rites.

Man is obliged to worship God and he expresses this worship by external rites. These rites and ceremonies which the Church makes use of in the administration of the Sacraments, in the divine offices and generally in the worship of God and the veneration of his Saints, form a grand object lesson for the people of God. They exhibit an external expression of the faith.

To see that these rites are diligently observed, to reform and amend, if need be books on sacred rites and ceremonies, to make, execute and interpret liturgical laws and solve the doubts arising in the execution of them, to prepare the causes of beatification and canonization, the Congregation of Rites was instituted. It owes its origin to Sixtus V, being instituted by him by the Constitution of 22 Jan. 1587.

The Congregation is two-fold; the Extraordinary, which occupies itself only with the beatification or canonization of saints; and the ordinary which decides the other questions pertaining to the jurisdiction of the Congregation of Rites.

The number of cardinals assigned to it depends upon the reigning Pontiff. There is the usual Prefect, the Secretary, an ecclesiastic who is called the Promoter of the Faith, and who has also an assistant, a chancellor, and a hymnographer, whose duty it is to arrange and correct the offices of the Saints and other such matters. Besides these there are a number of Consultors taken from the ranks of the secular and regular clergy.

United with this Congregation is the Holy Ceremonial Congregation, which has supervision of the liturgical and non-liturgical ceremonies used in the Papal Court.

7. Congregation of Indulgences and Relics.

By his Constitution «in Ipsis» of 6 July 1669, Clement IX instituted the Sacred Congregation of Indulgences and Relics. He invested the Congregation with the authority to resolve all doubts and difficulties about indulgences and relics and to correct abuses, to prohibit the publication of false or apocryphal indulgences, to authenticate relics recently discovered and to oversee the granting of indulgences and the distribution of relics.

The Congregation of Indulgences is formed on similar lines to those of other congregations. It has, therefore, a Prefect, a Secretary and Consultors, etc. It does not grant any indulgences; the Pope does that. All Rescripts or general concessions of indulgences must be shown under pain of nullity to the Secretary of the Congregation. Leo XIII ordered an authentic publication of all its decrees from the year 1668 to the year 1882. The work was brought out by Fr. Pustet and Co. and has been declared authentic.

8. Congregation for the Propagation of the Faith (*Propaganda Fidei*).

The first vestige of the Propaganda is found in a Commission instituted by Gregory XIII for the purpose of keeping the Catholics of the Greek Rite in the faith and of bringing back schismatics to the unity of the Church. After being perfected by Clement VIII it was finally erected as it is now constituted by Gregory XIV on 22 June 1622. Of all the Congregations, the Propaganda for English-speaking countries is the most interesting because the dioceses of these countries at the present time are subject to it. All the business which the faithful of missionary countries, clergy and laity, may have with the Holy See is done through the Propaganda.

In these countries it has exclusive jurisdiction and holds the place of all the other congregations. Missionary countries, in the language of the Church, are such as have no episcopal sees and whose ecclesiastical affairs are administered by delegates and vicars of the Pope. These vicars apostolic are usually bishops and are called titular bishops from the fact that they derive their title from some ancient see which no longer exists. But even after episcopal sees and dioceses are canonically erected in these missionary lands with bishops having ordinary jurisdiction, the Propaganda frequently retains the government of them. This is the case in the United States, England, Ireland, Scotland, Australia, Canada, Holland and some other countries.

The power of the Propaganda is legislative, judicial and gubernative. Hence it can make laws, decide controversies and rule over the countries in which it has jurisdiction. The resolutions and general decrees impose upon its subjects the obligation of obedience and are not merely the expression of a probable opinion, as was once asserted.

The Congregation is presided over by a Cardinal who is called Prefect-General. There is also one who is called Prefect of Economy. One of the other officials is a Protonotary Apostolic whose duty it is to collect the acts of martyrs who have sacrificed their lives in missionary countries. Almost every week the ordinary meeting is held, while the general assembly takes place usually once a month.

The principal work of the Propaganda is the spreading of the Catholic faith throughout the world. Consequently it has sent and still sends out many missionaries to preach the Gospel. To prepare young men for their missionary labors Urban VIII instituted the «College of the Propaganda» which is attached to the Palace of the Congregation. Connected with the Congregation of the Propaganda are:

a. The Congregation for the Affairs of the Oriental Rites.

b. The Congregation for the Correction of Books of the Oriental Rite.

c. The Examination of the New Constitutions of Religious Orders depending on the Propaganda.

d. The Commission for the Examination of the Reports of the Bishops and Vicars Apostolic under the Jurisdiction of the Propaganda.

e. The Commission for the Reunion of Dissenting Churches.

9. Congregation of Studies.

It was begun by Sixtus V and instituted by Leo XII. In the bull of Sixtus V the four famous universities of Paris, Oxford, Bologna and Salamanca are mentioned. Leo XIII enlarged the powers of the Congregation and extended its authority over all the Catholic universities of the world.

Its power lies in the erection, constitution and administration of the Catholic universities, for which, having consulted the Pope, it lays down standards concerning the professors, methods, academical decrees, etc.; solves doubts about rights, privileges and suits or disputes arising between the different universities regarding the degrees or privileges. By a Catholic University is meant one which confers degrees by apostolic authority. Those erected in recent years are the universities of Lille, Paris, Lyons, Angers, Fribourg, Ottawa, Laval and Washington.

Annexed to the Congregation of Studies is the Commission for Historical Studies.

10. Congregation for the Fabric of Saint Peter's.

The building of Saint Peter's Basilica in Rome was undertaken by Julius II in 1506. It took years to complete it and a large outlay of money was required in its building and afterward in its preservation. To administer its affairs Clement VIII in 1593 erected a special Congregation for the Fabric of Saint Peter's.

The Cardinal Archpriest of the Basilica is its Prefect. The scope and office of the Congregation, inasmuch as it is of practical moment to the Universal Church, has regard to donations for pious causes and to certain questions about obligations of saying masses; for example, the transferring of them from one church to another or from one altar to another; the extension of time for the saying of them; their reduction in number, etc.

11. Congregation for Extraordinary Ecclesiastical Affairs, concerning itself only with those matters which are submitted by the Supreme Pontiff through the Cardinal Secretary of State and especially matters having connection with civil laws and relating to concordats.

12. Congregation of Seminaries and Universities, instituted in 1915.

Besides the foregoing Congregations, the Sovereign Pontiff may at any time establish others or diminish the number of those already existing. Thus in 1895 Leo XIII established a commission for the work of fostering the reconciliation of non-Catholics with the Church.

Consult Ferraris, ‘Congregationes’; ‘Decrees of the Council of Trent’; Wernz, ‘Jus Decretalium’ (Vol. II, Rome 1899); Baart, ‘The Roman Court’ (Fr. Pustet, New York); Humphrey, ‘Urbs et Orbis, or the Pope as Bishop and as Pontiff’ (London 1899).

David J. O'Hearn,
Saint Francis Seminary, Milwaukie.

CONGRESS (Lat. «coming together,» «meeting»), a meeting of rulers or representatives of several states, to adjust disputes between different governments. It is necessary to distinguish the meeting in which preliminaries are settled, from the principal congress, which is to bring the affair in question to a decision. The plenipotentiaries when they meet, after mutual greetings, appoint, in a preliminary conference, the day on which the congress is to be opened, and determine the manner in which business is to be transacted, the forms of negotiation, the order of precedence among the different powers and the time of session. The congress opens by the exchange and perusal of credentials among the plenipotentiaries, which, in case the negotiating parties have referred to the arbitration of a mediator, are given to him. The envoys of the contending powers then carry on their negotiations directly with each other, or by the intervention of a mediator, either in a common hall or in their own residences by turns, or, if there is a mediator, in his residence. These negotiations are continued either by writing or by verbal communication, until the commissioners agree upon a treaty, or until one of the powers dissolves the congress by recalling its minister. Such meetings of the representatives of different countries are sometimes called conferences. The nominal difference between a conference and a congress is this, that the representatives of the different countries at the former are the ordinary ambassadors of the respective countries at the court at which the conference is held, while the representatives at the latter are specially deputed for the purpose. Among congresses of the 19th century the chief are the Congress of Vienna, 1815; of Paris 1856; of Berlin 1878; The Pan-American Congress at Washington, D. C. (1888–90).

CONGRESS, Continental. The first recognition of a solidarity of interests among the English colonies in America, and attempts at joint action against a common foe, were made in 1690, by Jacob Leisler, revolutionary dictator of New York; and his efforts were stimulated by the fact that New York bore the first brunt of Canadian invasion, and needed help. He invited the other colonies to send delegates to New York and contribute men and money for a counter-invasion; but none farther south than Maryland responded. A much more comprehensive plan was devised by Franklin in 1754 (see Albany Congress), but fell through. In 1765, on occasion of the Stamp Act (q.v.), a colonial congress from all the North except New Hampshire, and only South Carolina of the South below Maryland, met at New York 7–25 October, but took no action except to petition Parliament. In 1773, when the Revolution was impending, Franklin renewed his former suggestion in a letter to the assembly of Massachusetts, whose agent in London he was, but still nothing was done.

The next year, however, on receiving news of the Boston Port Bill, Virginia proposed to the other colonies a Continental Congress in the fullest sense; that is, including Canada, for it was not doubted that this recently subjugated province would gladly join in a revolt against its conqueror. Massachusetts responded 7 June, others followed, and the first real American Congress met in Philadelphia, 5 Sept. 1774, sitting till 26 October. Canada, however, was not represented; nor was Georgia, though it shared in all succeeding Congresses. The instructions to the delegates did not contemplate separation or forcible resistance, but only the proposal of measures to «restore harmony» with Great Britain; and the Congress merely drafted addresses to the king and the people of that country, to the Canadians, and to their own constituents, and recommended non-importation and non-exportation agreements, and the forcible resistance to any forcible attempt to carry out the Parliament's taxation measures. It also advised the immediate election of delegates to a fresh Congress in Philadelphia 10 May 1775; which was carried out by various bodies — legislative assemblies in some cases, popular conventions or committees of safety (q.v.) in others. None of these had any legal power to act for this purpose, and the title of all alike was the will of the *force majeure* of the people; for the loyalist section had equal right to oppose the elections, and it was tacit acceptance of superior fighting force that gave the title. The fact that this Congress was considered necessary at all, and was to have power to organize combined resistance to Great Britain, would be conclusive evidence that the leaders of public opinion had determined on independence unless highly improbable concessions were made, were it not for the extreme reluctance the Congress displayed in declaring it, only doing so under irresistible urgency from public opinion. A parallel case is the memory of the hopes of accommodation and conciliation by Union leaders not only in 1860–61, but all through the Civil War. The frequent charge of hypocrisy against the Revolutionary leaders involves one against all the patriotic statesmen of the decade before 1860.

As soon as war was actually proclaimed by Great Britain the second Congress assumed the fullest powers of sovereignty; much greater than those of the British Parliament, for it combined the powers of that body with those of the king, being itself both executive and legislative head of the nation. It raised military and naval forces and directed belligerent operations with them, authorized privateering, contracted treaty alliances, issued national currency, etc., in both capacities. This was by no usurped power, but by the urgency of the people, who were far more anxious to have it take the powers than it was to exercise them. The provincial congresses appealed to it for authorization, and the people urged it to more energetic action. Its crowning act was the Declaration of Independence; its business from 12 July to 20 August the debating of the scheme of government it had drafted (see United States—Articles of Confederation), but which was not put in force for five years, and for which it was perhaps slight misfortune to have waited. It sat till 12 Dec. 1776.

The session of 20 Dec. 1776 has been hesitantly called the third Continental Congress; for the delegates were selected entirely by the State legislatures, and the body as a whole had a title more definite and regular, though not in reality more legal. But in fact, the second Congress, from the opening on 10 May 1775, was a continuing body in perpetual session; with no definite term of sitting or terms of membership; the State legislatures which had selected members did not specifically send new ones for the new session, but each chose them for such terms as it pleased — Congress exercising no right of control in this matter — and recalled them at will. Each State had but one vote, all being thus equal, as in the Senate, where each has two; but in the Senate the members have individual votes. This provision in the Continental Congress was avowedly made only because a census could not then be taken to ascertain the relative populations. As under the Confederation, the Congress dealt with States, not individuals; and much of the impotence with which it is reproached in the Revolution was involved in this, though not all of its follies are thus excusable. Some of its worst performances, however — as the misdealing with the officers which drove some of them from the service permanently and others temporarily, and deeply injured the cause — were directly due to the tenacious individuality of the States, which claimed their share of the military patronage then as thev do of the civil patronage now.

A history of the Congress is a history of the country during its lifetime; but some of its migrations are significant of military reverses and recoveries. From 20 Dec. 1776 to 4 March 1777 it sat at Baltimore; 4 March to 18 Sept. 1777, at Philadelphia; 27 Sept. 1777, at Lancaster, Pa.; 30 Sept. 1777 to 27 June 1778, at York, Pa.; 2 July 1778 to 21 June 1783, at Philadelphia. But before this it had ceased to be the Continental Congress, and had become the Congress of the Confederation, on 2 March 1781, after the ratification of the Articles by Maryland. Consult Histories of the United States by Bancroft, Hildreth, Schouler, Von Holst, etc.; Fiske, 'Critical Period of American History' (1888).

CONGRESS, Library of. The National Library of the United States, an institution in Washington, D. C., since its removal from the Capitol in 1897, occupying the building erected for its accommodation under the acts of Congress of 15 April 1886, 2 Oct. 1888 and 2 March 1889, at a cost of $6,347,000 (limit by law, $6,500,000) exclusive of the land, which cost $585,000. The building occupies three and three-quarter acres upon a site 10 acres in extent at a distance 1,270 feet east of the Capitol, and is the largest and most magnificent library building in the world. In the decorations, 40 American painters and sculptors are represented. The floor space is 326,195 square feet or nearly eight acres. The book stacks contain about 100 miles of shelving, affording space for 3,540,000 octavo books and 84,000 volumes of newspapers. Annual appropriations are made by Congress for various purposes. In 1916 these amounted to $660,105, covering service and contingent expenses $451,460; purchase of books, $98,000; building and grounds, $110,645. The number of employees is 541; for the library proper, 255; distribution of cards, 44; disbursement and care of buildings and grounds, 134; legislative reference, 17; and for the copyright office, a distinct division of the library, 91. The main reading room, the periodical reading room and a reading room for the blind, are open to the public from 9 A.M. to 10 P.M. week-days, and from 2 P.M. to 10 P.M. Sundays and holidays, except Christmas Day and the 4th of July. The Library of Congress was established in 1800, destroyed in 1814 by the burning of the Capitol, afterward replenished by the purchase by Congress of the library of ex-President Jefferson, 6,760 volumes (cost, $23,950); in 1851, 35,000 volumes destroyed by fire; in 1852, partially replenished by an appropriation of $75,000; increased (1) by regular appropriations by Congress; (2) by deposits under the copyright laws; (3) by gifts and exchanges; (4) by the exchanges of the Smithsonian Institution, the library of which (40,000 volumes) was, in 1866, deposited in the Library of Congress, with the stipulation that future accessions should follow it. Fifty sets of government publications are placed at the service of the Library of Congress for international exchanges through the Smithsonian. Other special accessions have been: the Peter Force collection (22,529 volumes, 37,000 pamphlets), purchased 1867, cost $100,000; the (Count de) Rochambeau collection (manuscript), purchased 1883, cost $20,000; the Toner collection (24,484 volumes, numerous pamphlets), gifts in 1882 of Dr. Joseph M. Toner; the Hubbard collection (engravings), gift in 1898 of Mrs. Gardiner G. Hubbard; in 1905, 72 manuscript maps once owned by Richard, first Earl Howe, and 860 letters received by President Van

Buren. Notable recent accessions are the Weber library of Sanskrit literature, 3,018 volumes, 1,002 pamphlets; the Hattala (Slavic, about 1,500 volumes); Yudin (Russian, 80,000 volumes); the Huitfeldt-Kass (Scandinavian, 5,000 volumes); the John Boyd Thacher collection of Incunabula (deposited); the Deinard collections of Hebraica comprising upward of 14,000 titles given to the library by Mr. Jacob H. Schiff in 1912 and 1914; the Henry Harrisse bequest, 1914, of 220 volumes and pamphlets, mostly dealing with early phases of American history; and the gift, 1915, from Mr. Nieh Chi-Cheh, vice-chairman of the Honorary Commercial Commission from the Republic of China, consisting of a diary kept by his grandfather, in 40 volumes. The entire collection, now the largest in the American hemisphere and the third in the world, is rich in history, political science, in Federal documents and Americana in general, including important files of American newspapers and original manuscripts of colonial, revolutionary and formative periods. At the end of the fiscal year 30 June 1915 the collection comprised 2,363,873 printed books and pamphlets (including the law library which, while a division of the Library of Congress, still remains at the Capitol), manuscripts, maps and charts, pieces of music and photographs, prints, engravings and lithographs, numbering about 1,000,000. While it is primarily and essentially a reference library, it maintains an inter-library loan system by which special service is rendered to scholarship by the loan of rare and unusual books to other libraries for the use of investigators engaged in serious research. Through its distribution of printed catalogue cards it also places at the disposal of all libraries, large or small, the best expert cataloguing and book information at a price much below the cost of even the crudest manuscript cataloguing. The service which perhaps reaches more citizens than any other is the response made to letters of inquiry from all parts of the country and on every conceivable topic. The relations of the Library of Congress to the other government libraries (which number about 63 out of a total of 137) are also of necessity very close, since they are all under the same controlling influence—service to the Federal government. Its relations to the libraries of Washington city, not governmental, while less direct, are hardly less intimate. They all draw from its immense reservoir, and their acquisitions and even their management are largely influenced by their proximity to the Library of Congress. Several of the larger government libraries have attained a real distinction, notably the Library of the Surgeon-General's Office, 7th and B streets S. W., which is now perhaps the leading medical library of the world containing about 525,000 volumes and pamphlets; the library of the Department of Agriculture at 12th and B streets, consisting of about 150,000 volumes; the library of the Bureau of Education/in the old Post-Office Department building at 8th and F streets, N. W., containing about 165,000 volumes; the library of the Geological Survey at 1330 F street, containing over 190,000 volumes; the Public Documents Library; the libraries of the Bureau of Labor Statistics, of the Reclamation Service, of the Bureau of Standards, and of the Bureau of Railway Economics; while the libraries under the jurisdiction of the Smithsonian Institution offer an interesting group to those concerned with the natural sciences. The largest is the library of the National Museum, containing 45,000 volumes, and about 75,000 unbound pamphlets, the largest assemblage of the transactions of learned societies which exists in the country. Altogether the Library of Congress with its affiliations is considered by many who are familiar with the national libraries of foreign countries to be more truly a national library than any other in the world in the extent and variety of the functions it performs and the service it renders to libraries and to citizens throughout the country. The chief librarians since its inception have been: 1800–14, the contemporary clerk of the House of Representatives; 1815–29, George Watterson; 1829–61, John S. Meehan; 1861–64, John G. Stephenson; 1864–97, Ainsworth R. Spofford; 1897–99, John Russell Young; Herbert Putnam since 1899.

CONGRESS OF THE CONFEDERATION. See CONGRESS, CONTINENTAL.

CONGRESS AND EXECUTIVE. See EXECUTIVE.

CONGRESS OF RELIGIONS or **WORLD'S PARLIAMENT OF RELIGIONS.** A congress held at the Columbian Exposition, Chicago, in 1893, in an attempt to bring together in one great world convention representatives of the great and historic religious creeds of the world. The congress was very successful, and all its meetings passed off in perfect harmony, notwithstanding the doubt previously expressed in many quarters as to the expediency of calling such a congress at the World's Fair which was to be essentially a bid for the amity and co-operation of the nations. The Congress of Religions, which was what its name implies, was made up of representatives of the creeds of all the great countries of the world; and it treated of almost every aspect of religion. It was the outcome of many attempts to bring together the great religions of the world. The idea of a union of this kind had often appeared in Chinese fiction and poetry; and both China and Japan had led the way in religous toleration by allowing various creeds to flourish side by side in their respective territories hundreds of years before religious toleration was thought of in Europe. More than three centuries ago John Comenius, the great religious thinker and reformer, had suggested such an idea. Almost half a century ago the Free Religious Association of Boston advocated the idea of a congress of the various religions of the world with a view to making a scientific study of religious thought, origin and growth. In 1873, the great Buddhist Emperor of India, Asoka, called a congress of all the religions of the East, and more especially those of India, at Palateputra, now Patna; and he actually gathered the brightest minds of the East in religious circles in the congress, which was a pronounced success. So the religious centres of India, owing to their comparative liberalism, were ready to respond to the call issued in June 1891 for a Congress of Religions to be held in Chicago in connection with the World's Fair in 1892. The exposition was unavoidably postponed until the following year and with it the meeting of the Congress of Religions. This was fortunate for the latter as it gave the organizers much more time in which to reach the leaders of religious thought throughout the world. The World's Parliament of Religions, as the congress was ultimately named, set for its aim a wide and varied program which included the bringing together into a congress of leading representatives of the great historic religions of the world; the showing of the important truths held by various religions; the promoting of the spirit of human brotherhood among religious men of diverse faiths; the setting forth of the important distinctive truths held and taught by each religion and by the various branches of Christianity. It aimed to indicate the impregnable foundations of theism and the reasons for man's faith in immortality; the spiritual and other effects of the various religions upon literature, art, commerce, government and domestic and social life. The Congress was asked to consider what light each religion has afforded or may afford to other religions; the present condition and outlook of religions among the leading nations of the world and the light religion has thrown upon the great problems of the present age, such as temperance, labor, education, poverty, wealth. The promoters expressed their hope of eventually bringing about permanent international peace by bringing the nations of the earth into a more friendly fellowship. Consult 'World's Parliament of Religions,' a collection of the addresses made at the congress and an account of the proceedings of the same.

CONGRESS OF THE UNITED STATES. The legislative branch of the Federal government of the United States. The discussion of this body falls naturally into three parts: (1) The constitutional mandates concerning it; (2) its own rules and usages; (3) its practical functions as developed by historical evolution.

1. By the first article of the Constitution, the legislative power of the country, so far as granted at all, is «vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.»

The Senate must consist of two senators from each State (thus equalizing the power of the States to safeguard their own interests), elected by the State legislatures for six years; the terms so arranged that one-third are vacated every two years, making it a continuing body. Each legislature fills any vacancy in its State delegation caused by death or resignation, but if one occurs while it is not in session, the governnor of the State may fill it pro tem. till the legislature meets. A senator must be 30 years old, nine years a citizen and an inhabitant of the State which elects him; but the legal definition of residence is impliedly left to the State. The president of the Senate is the Vice-President of the United States, who has only a casting vote; but in his absence, or on his accession to the presidency, it shall choose a president pro tem. All impeachment trials are its prerogative, to be decided by a two-thirds vote; if the President is impeached, the chief justice presides; it can inflict no punishment but removal from and disqualification for office. No treaties are valid without the consent of two-thirds of the Senate; nor any appointment to office by the President without the consent of a majority of it, unless Congress takes away this power from the senatorial half of itself, which it is not likely to do.

The House must consist of members chosen for two years by popular election, so that each House is a new body; the voters to be the same who choose the most popular branch of each legislature; each member must be 25 years old, seven years a citizen, and an inhabitant of the State. The number from each State must be graded by population, determined by a decennial national census (in the body of the Constitution, three-fifths of the slaves are to be counted in, a provision made obsolete by the Thirteenth Amendment). These representatives must not exceed one to 30,000 inhabitants — which would allow a maximum of about 2,550 at present, in place of the actual 440. The members receive an annual salary, determined by Congress, the amount of which at present is $7,500. In case of vacancy, the State executive is to issue a writ of election to fill it. The House chooses its own speaker who receives a salary of $12,000. And lastly, it has the sole power of presenting the impeachments which the Senate has the sole power of trying.

The State legislatures were to fix the times, places and manner of electing members of either House, subject to the right of Congress to change anything but the place of electing senators, which was the legislative chamber until 1913, when the 17th Amendment to the Constitution, providing for the direct vote for senators by the people, was ratified and declared in force. But the numerous deadlocks and failures to elect, due to the two branches of the legislature being under different political control, and the minority House refusing to meet the other for an election, led to the law of 2 July 1866, prescribing a uniform rule for all States. Congress is to meet at least once a year; on the first Monday in December unless it orders otherwise. The President can convene a special session on «extraordinary occasions»; but he cannot adjourn or prorogue it except in case of disagreement between the Houses — a provision suggested, like so many others, by the quarrels of the English Parliaments with the kings. Each House is the judge of the qualifications of its own members. A majority of each constitutes a quorum; but a single member can adjourn from day to day, and can compel the attendance of enough absent members to make a quorum if the House will provide a rule for so doing. Each House makes its own rules of procedure, can punish members for disorderly behavior and two-thirds can expel a member. Each must keep a journal of its proceedings (see CENSURE, CONGRESSIONAL, for argument on the implications of this), and publish it, except such part as the House judges best to keep secret. One-fifth of the members present at any time may compel a yea and nay vote to be taken on any question and entered on the journal. Neither House during a session shall adjourn for more than three days or to any other place, without consent of the other. Members of both Houses shall be paid by the nation. They shall be exempt from arrest during the session and in journeys to and from, and from liability for any utterances in debate — a reminiscence of the burning need of such provision in older English history; not often invoked now, and still less often for creditable reasons. No member shall be appointed to any office created or its pay increased during his term — again a souvenir of temporary political squabbles; and no office-holder shall be at the same time a member. Bills for raising revenue must originate in the House (originally a safeguard for the large States, against the small ones using their power in the Senate to throw the financial burdens on their richer neighbors); but the Senate can propose amendments. Bills vetoed by the President must be reconsidered by, and the objections entered in full on the journal of, the House where they originated; and a two-thirds vote may pass it to the other House, a two-thirds concurrent vote of which makes it a law. (The first Congress, on the question arising, decided this to mean two-thirds of those present and voting, not of the whole membership). Such votes must be yea and nay and entered on the journals. A bill not returned by the President within 10 days (Sundays excepted) becomes a law *ipso facto,* unless Congress adjourns meanwhile, when it lapses. No order, resolution or vote of the concurrent Houses is valid without the assent of the President, except one to adjourn.

The powers of Congress are generally those inherent in every sovereign assembly of the people; but there are two important restrictions. The President's veto (above) is a very real restraint on tyranny by a bare majority, perhaps not honestly obtained and always inviting dishonesty with such supreme power; and it retains full vitality, while the English royal veto has perished. Still more important is its confinement by the Constitution to the powers expressly granted: its laws are invalid if pronounced by the Supreme Court contrary to the Constitution, while a majority vote of the English Parliament could theoretically abolish the monarchy or hang the entire population. Too much is sometimes made of this, however. The «implied powers» of caring for the national welfare have been found in practice elastic enough for every claim of sovereignty. As to the Supreme Court, it is the creature of an act of Congress and could be abolished by another (as a whole system of national courts actually was); more simply, it can be and has been swamped and packed to reverse an unpopular decision, and if its decisions are defied (as under Jackson), it is powerless to enforce them. Hence it is very cautious about deciding «political» issues of burning intensity (see CHEROKEE NATION v. GEORGIA), except in the sense of the majority or opposing strong popular feeling. In a word, Congress is the ultimate sovereign. Its inhibitions by the Constitution reflect past history and the politics of the time curiously enough. It was not to prohibit the slave-trade before 1808, and not to grant titles of nobility — conversely, no one is to receive office, title or gift from any foreign potentate without its consent; it is not to suspend the habeas corpus except on account of rebellion or invasion, not to pass bills of attainder, not to lay export taxes, nor direct taxes except in proportion to population, not to give preferential duties between the States, or enforce clearances at ports outside a vessel's destined State. Not all of these things were needless fetters; and certainly the prohibition from drawing money except on regular appropriations, and the injunction to publish the disposition of the money drawn, was not one.

There being at present 48 States, the number of senators is 96. The number of representatives has never been determined by the constitutional provision, whose minimum was fixed when the country had but 2,500,000 or so of inhabitants. The maximum has been slowly enlarged at each census, each State retaining all it had, while the States with increased population have been given more members. The basis of apportionment under the census of 1910 is one representative to every 212,407 inhabitants. This furnishes the following representation for the several States: Alabama, 10; Arizona, 1; Arkansas, 7; California, 11; Colorado, 4; Connecticut, 5; Delaware, 1; Florida, 4; Georgia, 12; Idaho, 2; Illinois, 27; Indiana, 13; Iowa, 11; Kansas, 8; Kentucky, 11; Louisiana, 8; Maine, 4; Maryland, 6; Massachusetts, 16; Michigan, 13; Minnesota, 10; Mississippi, 8; Missouri, 16; Montana, 2; Nebraska, 6; Nevada, 1; New Hampshire, 2; New Jersey, 12; New Mexico, 1; New York, 43; North Carolina, 10; North Dakota, 3; Ohio, 22; Oklahoma, 8; Oregon, 3; Pennsylvania, 36; Rhode Island, 3; South Carolina, 7; South Dakota, 3; Tennessee, 10; Texas, 18; Utah, 2; Vermont, 2; Virginia, 10; Washington, 5; West Virginia, 6; Wisconsin, 11; Wyoming, 1; and 5 delegates from Territories as follows: Alaska, Hawaii and Porto Rico, 1 each; Philippines, 2. Total, 440.

2. Each house has its own system of rules for business (78 in the Senate, 45 in the House), with vital differences. The most far-reaching is the previous question in the House and the absence of it in the Senate. The reasons for the difference are obvious: the great number of representatives, and the fact that most bills are first introduced there, would make business not merely difficult but impossible if everyone could talk at will to any length; the smaller numbers and lesser business of the Senate enable free debate to be retained. The House restricts speeches to an hour; the Senate has no restriction except that a member cannot speak over twice a day on the same question. Each system of course has its attendant possibility of evil: the suppression of needful public light on bills in the one case, «filibustering» and holding up of public business by a factious or interested minority in the other. The business of both houses is done by committees; neither will consider bills or memorials at once on presentation, except on suspension of the rules — which to be sure, during the latest days of a session, lets through vast numbers of undebated, unexamined and unknown bills. But by rule they must be referred to some standing committee, of which there are now 48 in the House and 32 in the Senate, besides 10 select committees in the House and 12 in the Senate; and three joint standing committees. The functions of these committees are assigned by the rules; but as these lap over, two or three committees often contend vigorously for the possession of some one bill. In the Senate, these bills are presented in open session on the floor; in the House they are handed to the clerk indorsed with such reference or disposition as the presenting member wishes made. These committees are appointed in the House by the Speaker; in the Senate they are chosen by caucus of the majority party and elected by a single yea and

nay vote though the rules say by ballot "unless otherwise ordered." In case of differences between the Houses which continually occur, they are harmonized by committees of conference, three senators and three representatives. The most steadily powerful of these committees, which can obtain the floor at any time, are those on Appropriations in each house, disbursing the money in the treasury, and on Privileges and Elections, deciding the right of every member to his seat; next to these, on revenue (Ways and Means in the House, Finance in the Senate), with enormous power to help or harm the great businesses of the country — many think too much — and on Printing, which of course is an immediate matter. Next in actual favor come, perhaps, those on Rivers and Harbors and on Pensions, branches of that on Appropriations which they involve; and when new States are to be admitted, on Territories. In formal dignity the Senate committees on Foreign Affairs, on the Judiciary and on Military and Naval Affairs, take high rank; so in the House do those on Rules, Foreign Affairs, Judiciary, Military Affairs and Naval Affairs; and of course special circumstances at any time may temporarily make any one of these, or almost any other committee, the centre of interest to which everything else must give way. In some respects most important of all except the Appropriations Committee are the special conference committees, which do an immense share of the actual legislation of the country: they compromise conflicting business and political interests, include or exclude bills, decide on appropriations, etc., and being usually appointed in the crowded closing days of a session, generally have their recommendations heeded.

3. The changes in congressional functions and relations, from the intent of the framers of the Constitution, come under three heads: (1) The position of Congress as a whole regarding the executive; (2) the position of the two houses regarding each other; (3) the position of the whole body regarding legislation.

(1) The Constitution attempted a total separation and absolute equality between the executive and legislative branches, the latter deciding on measures of public welfare and the former carrying them out. How far this would be desirable if perfectly accomplished — altogether forbidding one branch of the government to think and the other to act — might be questioned, but will not be argued here. At any rate, it was never remotely realized except when both were in deadly need of the same thing, or one was content to forego thinking. The ideal example of its best is probably the Lincoln administration, a strong executive and a strong Congress with the same essential purposes; of its worst, the Johnson administration, where the thoughts of the one and the acts of the other were at irreconcilable variance, and what the one most wished done was what the other was most set on not doing. More usually, one side or the other has been master. The extreme instance of executive mastery was the Jackson administration, where a resolute and aggressive leader, with a not too reflective popular majority behind him, got such legislation as he wished; of congressional mastery, each reader may prefer to choose his own instance. But there can be no question that the balance inclines more and more decisively to the congressional side. Of late years the results of attempted executive independence have been more picturesque than successful. The Senate, which has the confirmation of treaties and appointments, cannot be prevented from signifying in some form what treaties and appointments it will confirm; and the body which can grant or refuse money for public purposes can decide what those purposes shall be.

(2) The change of power between the Houses is not so dramatically obvious, but it is quite as notorious and is easily explicable. The Senate has some superiorities: its long terms both attract superior men on an average and enable them to acquire parliamentary knowledge and public weight; its committees are still its servants rather than its masters — preparing legislation for it to discuss, rather than merely killing most of it, and leaving the rest to run in an undiscussed huddle through the open sluice at the last; and it has time and rules that permit some genuine argument, for its own and the public's enlightenment. But these very terms render seats so valuable and desirable that members are more loath to peril them than House seats; and the Senate, which was expected to have more independence than the House from the length of terms, has actually of late years had less backbone and less willingness to run counter to popular currents within its own party than the House. Moreover, the license of debate has too often been a mere license of wanton obstruction, bringing forward no new facts or illuminating discussion, but only exhibiting the spectacle of the will of 100,000,000 people nullified by one or two of its servants. This does not contradict, but only supplements, the other evil. On the other hand, the unity and dispatch of public business made possible in the House by the nominal autocracy and real leadership of the Speaker, aided by the committees and the previous question, have made it seem more and more the body where something is accomplished and the will of the people carried into execution.

(3) The drift of our form of government, and the coming position of Congress and its organs within it, are to some extent matters of prophecy rather than fact; and political philosophers have been busy with them. But some things are certain, and though commonplace, must be recited. Chief of them are the control of the Speaker and the committees over legislation. That the Speaker is a totally different officer from the English Speaker is obvious. He puts motions, decides question of rule and order, and represses disorder, it is true; but instead of being a sworn judge he is a recognized party chief, with functions which approximate the English premier much more closely than the other. By his appointment of the committees he determines the line which legislation shall take, and in a broad way the bills which shall or shall not be considered; and by his daily power of recognizing members who wish the floor, in which he is held to none but party responsibility, he still further molds the total impression which the measures shall make on the public. But he is no autocrat; his very influence can only be exercised by appointing the chief party leaders to the committees, and once there, it is they and not he who hold the decisive power; he and they together, in fact, form something like the shaping committee which

is what the English Cabinet, headed by the premier, has fully become. The Cabinet officers, moreover, are fast becoming advisers of the committees rather than of the President. These approximations to the English position have caused many to think that the transformation will be fully carried out, and the parliamentary system established in fact if not in form in the future; the speaker having the full power of the premier, and the President becoming a dignified nullity like the sovereign of England. But there are still some vital differences, and it is not easy to foresee the process by which they will be overcome. It is true that the admission of Cabinet officers to the floor of either House, to expound their views and needs and explain doubtful questions, is within a simple permissive vote of that House at any time, and can perfectly well be made a standing rule; and that the consequent necessity of their being skilful speakers and capable expositors would profoundly modify the character of men chosen for that position. But the committee do not want information on the floor of the House of Representatives at least: they have no time to attend to it there, and the rules would mostly shut it off before anything material had been communicated. They want it in their committee rooms, and that needs no change in the men and would involve none before the public. The officers cannot become primarily public speakers and secondarily executive officers unless the House gives up its time to debate; and the whole tendency is the other way, nor is it evident where the new time would be found or taken. The place where the change would have to take place is in the Senate, if at all; but the power of legislation more and more drifts away from the Senate except as concurrent; and the new debaters, if they arrive, will seemingly be more in the position of those in the House of Lords than of Commons, which would be immaterial. Still greater is the obstacle of fixed terms. The English members of the Commons remain no longer when the people vote that they do not want them, and it is consequently the great party object to obtain such a vote and to put the other party in a position where they must be disgraced if they do not ask the people to give one pro or con. But the American member must serve out his term, and he can do so if his party has lost all public favor: the tremendous sweep of 1874 did not shorten any Republican member's term for a day, nor imperil any piece of Republican legislation, for which they had an entire session after they were voted down, and as many special ones as the President had chosen to call; and similarly with reverses of the other side. This alone prevents debate from taking up time in the House; it is mainly a sham battle, the real one having been fought in committee. Still further, the English committee called the Cabinet is all of one party, represents it, goes down with it; and the bills it puts forward are the party's bills.

L. M. Cockrell,
Late United States Senator from Missouri.

CONGRESS OF THE UNITED STATES, Sessions of and Politcal Parties in. In accordance with the usage of the 'Annals of Congress,' the 'Register of Debates in Congress,' the *Congressional Globe* and the *Congressional Record,* we have used the legislative day for the termination of the first 56 Congresses and the calendar day beginning with the 57th Congress in 1901. The practice of Congress in this connection is based on the fact that it does not recognize the calendar day but only the legislative day, nor are Sundays and the forenoon of 4 March recognized as legislative days. The legislative day of 3 March does not expire until 12 o'clock noon of 4 March. In the *Monthly Catalogue United States Public Documents* (No. 195, p. 492, March 1911) issued by the superintendent of public documents, is the following note:

> "If on any day either Senate or House refuses to adjourn, but instead takes a recess, no matter of what duration, the legislative day continues without regard to the almanac. This prolongation of the legislative day has, under the rules, various effects upon the status and the progress of pending bills and motions. . . . Whatever they may be, the legislative day remains simply a legislative fiction. The calendar day, the real day, of course can not be affected by any action of Congress. In the Proceedings of Congress as reported in the Congressional Record both the fictitious legislative date and the true calendar date have been published in recent years when the two dates conflict. Of course as a general rule the two dates harmoniously agree. It is only when a parliamentary struggle or 'filibuster' is afoot that the fictitious legislative day sets the Gregorian calendar at defiance. Almost the only cases in which the recognition of the legislative day affects the accuracy of the public records is when it makes the sessions of Congress seem to have closed at a time when they really did not close.
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> . . . .
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> "The Constitution fixes the duration of Congressional terms, but the constitutional provision has been differently construed at different periods. In the early years of the Republic it was generally held that the term of a Congress lawfully ended at midnight of March 3 in the odd-numbered years. As a matter of fact it never did end then. The work of legislation was usually continued far into the small hours of March 4, despite earnest protests often made. Finally, March 3, 1851, both the Senate and the House took official action determining that the legal date for the closing of Congress is 12 o'clock noon of March 4 (Consult A. C. Hinds, 'Precedents of the House of Representatives,' Vol. V, pp. 862–863). This ruling has been ever since invariably followed. Whenever the legislative varies from this date as the closing date of a Congress it is wrong. Minor departures, provided for by turning back the official clocks, and winked at by all departments of the government, have of course been disregarded in compiling the check list."

In spite of this ruling and another in 1881, however, the *Congressional Record* continued to use the old legislative day as the running headline date until the end of the 56th Congress in 1901, though the text indicates the calendar days covered by the legislative days, which is very apt to confuse one not accustomed to this method. Moreover, in several instances (as in the last sessions of the 39th, 50th, 53d and 56th Congresses) 3 March was Sunday, wherefore the *Record* is antedated to 2 March (Saturday), though the pages of the volumes themselves indicate not only that Congress sat on Sunday but also on Monday, 4 March. Hence, while the *Record* shows that in these cases a member of either House made a speech on Monday, 4 March, calendar day, he is said to have spoken on Saturday, 2 March, legislative day.

Another source of probable confusion to those unfamiliar with Congressional proceedings is the method pursued by Gales and Seaton in printing the 'Annals of Congress.' The proceedings of some special sessions will be found in the volumes containing the proceedings of the Congress which had just expired. For instance, the proceedings of the special session of the Senate 8–26 June 1795 (which was a part of the 4th Congress) will be found at the end of the proceedings of the second session of the 3d Congress. As they are incorporated there without explanation or comment of any kind, the reader may be misled into supposing that this session of the Senate belonged to the 3d Congress.

When the government came into being in 1789 there were two parties — the Federalist and Republican, which, like European and English parties, were based largely on class distinctions. For all practical purposes the first session of Congress was non-partisan, since the few Senators and Representatives who openly avowed anti-Federalist sentiments never acted together as a party. But when the measures of Alexander Hamilton (q.v.) were introduced and pushed, the opposition gradually began to assume permanent form, though members did not consider themselves strictly party men. The following figures indicate as nearly as possible the number of those who upheld and those who feared and disliked the government and its measures.

First Congress

First session — 4 March to 29 Sept. 1789.
Second session — 4 Jan. to 12 Aug. 1790.
Third session — 6 Dec. 1790 to 3 March 1791.
Senate — 17 Administration; 9 Opposition.
House — 38 Administration; 26 Opposition.
Speaker of House — Frederick A. Muhlenberg (Pa.), Opposition.

After the first Congress opinions became more widely divergent and to the followers of Jefferson and Hamilton the names of Republicans and Federalists began to be attached. Still many members of Congress were pleased to called themselves independents, and not before the end of Washington's second term did party loyalty in its strict sense make its appearance. At the opening of the second Congress, the Federalists, being in the majority, took away the speakership from Muhlenberg and gave it to a recognized supporter of the administration.

Second Congress

Special session of Senate — 4 March 1791.
First session — 24 Oct. 1791 to 8 May 1792.
Second session — 5 Nov. 1792 to 2 March 1793.
Senate — 16 Federalists; 13 Republicans.
House — 37 Federalists; 33 Republicans.
Speaker of House — Jonathan Trumbull (Conn.), Federalist.

In the third Congress the party majorities were reversed, and accordingly the Republicans again placed Muhlenberg in the Speaker's chair. From this time the election of a Speaker was indicative of the party strength in the lower house, whereas the office of President pro tempore of the Senate, though regarded as a party office, did not carry with it in later years the power accorded to the Speaker and hence never involved a test of party strength. For that reason no mention is made here of Presidents pro tempore of the Senate.

Third Congress

Special session of Senate — 4 March 1793.
First session — 2 Dec. 1793 to 9 June 1794.
Second session — 3 Nov. 1794 to 3 March 1795.
Senate — 13 Republicans; 17 Federalists.
House — 57 Republicans; 48 Federalists.
Speaker — Frederick A. Muhlenberg (Pa.), Republican.

In the fourth Congress the parties were nearly evenly divided, but while at the outset the Republicans were supposed to have a majority, a moderate Federalist was elected Speaker, and on all important administrative measures the Federalists were able to control a majority. After the fourth Congress, however, party lines became fixed and easily distinguishable, wherefore the division in each house can be clearly indicated.

Fourth Congress

Special session of Senate — 8–26 June 1795.
First session — 7 Dec. 1795 to 1 June 1796.
Second session — 5 Dec. 1796 to 3 March 1797.
Senate — 13 Republicans; 19 Federalists.
House — 52 Republicans; 54 Federalists.
Speaker — Jonathan Dayton (N. J.), Federalist.

Fifth Congress

Special session of Senate — 4 March 1797.
First session — 15 May to 10 July 1797.
Second session — 13 Nov. 1797 to 16 July 1798.
Special session of Senate — 17–19 July 1798.
Third session — 3 Dec. 1798 to 3 March 1799.
Senate — 20 Federalists; 12 Republicans.
House — 58 Federalists; 48 Republicans.
Speaker — Jonathan Dayton (N. J.), Federalist; George Dent (Md.), pro tempore.

Sixth Congress

First session — 2 Dec. 1799 to 14 May 1800.
Second session — 17 Nov. 1800 to 3 March 1801.
Senate — 19 Federalists; 13 Republicans.
House — 64 Federalists; 42 Republicans.
Speaker — Theodore Sedgwick (Mass.), Federalist.

Seventh Congress

Special session of Senate — 4–5 March 1801.
First session — 7 Dec. 1801 to 3 May 1802.
Second session — 6 Dec. 1802 to 3 March 1803.
Senate — 18 Republicans; 14 Federalists.
House — 69 Republicans; 36 Federalists.
Speaker — Nathaniel Macon (N. C.), Republican.

Eighth Congress

First session — 17 Oct. 1803 to 27 March 1804.
Second session — 5 Nov. 1804 to 3 March 1805.
Senate — 25 Republicans; 9 Federalists.
House — 102 Republicans; 39 Federalists.
Speaker — Nathaniel Macon (N. C.), Republican.

Ninth Congress

Special session of Senate — 4–6 March 1805.
First session — 2 Dec. 1805 to 21 April 1806.
Second session — 1 Dec. 1806 to 3 March 1807.
Senate — 27 Republicans; 7 Federalists.
House — 116 Republicans; 25 Federalists.
Speaker — Nathaniel Macon (N. C.), Republican.

Tenth Congress

First session — 26 Oct. 1807 to 25 April 1808.
Second session — 7 Nov. 1808 to 3 March 1809.
Senate — 28 Republicans; 6 Federalists.
House — 118 Republicans; 24 Federalists.
Speaker — Joseph B. Varnum (Mass.), Republican.

Eleventh Congress

Special session of Senate — 4–7 March 1809.
First session — 22 May to 28 June 1809.
Second session — 27 Nov. 1809 to 1 May 1810.
Third session — 3 Dec. 1810 to 3 March 1811.
Senate — 28 Republicans; 6 Federalists.
House — 94 Republicans; 48 Federalists.
Speaker — Joseph B. Varnum (Mass.), Republican.

Twelfth Congress

First session — 4 Nov. 1811 to 6 July 1812.
Second session — 22 Nov. 1812 to 3 March 1813.
Senate — 30 Republicans; 6 Federalists.
House — 108 Republicans; 36 Federalists.
Speaker — Henry Clay (Ky.), Republican.

Thirteenth Congress

First session — 24 May to 2 Aug. 1813.
Second session — 6 Dec. 1813 to 18 April 1814.
Third session — 19 Sept. 1814 to 3 March 1815.
Senate — 27 Republicans; 9 Federalists.
House — 112 Republicans; 68 Federalists.
Speakers — 1813–14, Henry Clay (Ky.), Republican; 19 Jan. 1814–15, Langdon Cheves (S. C.), Republican.

After the War of 1812 came the era of good feeling, during which there was practically no opposition in Congress to Madison and Monroe, and while the old names persisted they ceased to have any political significance, beyond the fact that few Federalists were appointed to offices under the national government. After 1815 the members of the House ceased to vote for a separate candidate for Speaker, so that it is almost impossible to state precisely the number of Federalists in Congress. Even in 1824, when the Republican presidential nomination was to be made, a rough guess placed the number of Federalists in Congress at 40 or 45, but this was only conjecture. However, as closely as it is possible to come, the division was as follows:

Fourteenth Congress

First session — 4 Dec. 1815 to 30 April 1816.
Second session — 2 Dec. 1816 to 3 March 1817.
Senate — 25 Republicans; 11 Federalists.
House — 117 Republicans; 65 Federalists.
Speaker — Henry Clay (Ky.), Republican.

Fifteenth Congress

Special session of Senate — 4–6 March 1817.
First session — 1 Dec. 1817 to 20 April 1818.
Second session — 16 Nov. 1818 to 3 March 1819.
Senate — 34 Republicans; 10 Federalists.
House — 141 Republicans; 42 Federalists.
Speaker — Henry Clay (Ky.), Republican.

Sixteenth Congress

First session — 6 Dec. 1819 to 15 May 1820.
Second session — 13 Nov. 1820 to 3 March 1821.
Senate — 35 Republicans; 7 Federalists.
House — 156 Republicans; 27 Federalists.
Speakers — 1819–20, Henry Clay (Ky.), Republican; 15 Nov. 1820–21, John W. Taylor (N. Y.), Republican.

Seventeenth Congress

First session — 3 Dec. 1821 to 8 May 1822.
Second session — 2 Dec. 1822 to 3 March 1823.
Senate — 44 Republicans; 4 Federalists.
House — 158 Republicans; 25 Federalists.
Speaker — Philip P. Barbour (Va.), Republican.

Eighteenth Congress

First session — 1 Dec. 1823 to 27 May 1824.
Second session — 6 Dec. 1824 to 3 March 1825.
Senate — 44 Republicans; 4 Federalists.
House — 187 Republicans; 26 Federalists.
Speaker — Henry Clay (Ky.), Republican.

In 1825 Jackson became the presidential nominee of those opposed to the administration of President John Quincy Adams, which opposition ultimately developed into the Democratic party. But Jackson's adherents had no definite policy in Congress, their main object being to elect Jackson, and hence the existence of Jacksonian majorities in the Houses of Congress had no legislative significance. With the Jacksonians it was purely a question of loyalty to their chief, and so long as he had no Congressional policy, his followers might differ widely on all other national issues save that of placing Jackson in the presidential chair. For some years the actual leadership in legislation was exercised by the minority members. In 1828 those who supported Adams took the name National Republicans, and the Jacksonians became known as Democrats.

Nineteenth Congress

Special session of Senate — 4–9 March 1825.
First session — 5 Dec. 1825 to 22 May 1826.
Second session — 4 Dec. 1826 to 3 March 1827.
Senate — 26 Administration; 20 Jacksonians.
House — 105 Administration; 97 Jacksonians.
Speaker — John W. Taylor (N. Y.), Administration.

Twentieth Congress

First session — 3 Dec. 1827 to 26 May 1828.
Second session — 1 Dec. 1828 to 3 March 1829.
Senate — 28 Jacksonians; 20 Administration.
House — 119 Jacksonians; 94 Administration.
Speaker — Andrew Stevenson (Va.), Jacksonian.

Twenty-first Congress

Special session of Senate — 4–17 March 1829.
First session — 7 Dec. 1829 to 31 May 1830.
Second session — 6 Dec. 1830 to 3 March 1831.
Senate — 26 Democrats; 22 National Republicans.
House — 139 Democrats; 74 National Republicans.
Speaker — Andrew Stevenson (Va.), Democrat.

In the 22d Congress appeared some members of the Anti-Masonic party and there were some Democrats, followers of Henry Clay, who termed themselves Clay Democrats. After 1833 Jackson began to lose his following owing to his nullification policy (when the Nullifiers formed a separate faction) and his determination to have Van Buren succeed him in the Presidency, which drove into opposition a number of «State rights» Democrats. In the 24th Congress the National Republicans, Anti-Masons and State Rights or anti-Van Buren Democrats banded together as Whigs. After Van Buren became President, the Democrats who opposed the sub-treasury plan became known as Conservatives, while a group of former State Rights Whigs supported Van Buren's policy and the Nullifiers rejoined the Democratic party.

Twenty-second Congress

First session — 5 Dec. 1831 to 16 July 1832.
Second session — 3 Dec. 1832 to 2 March 1833.
Senate — 25 Democrats; 21 National Republicans; 2 Anti-Masons.
House — 141 Democrats; 58 National Republicans and Clay Democrats; 14 Anti-Masons.
Speaker — Andrew Stevenson (Va.), Democrat.

Twenty-third Congress

First session — 2 Dec. 1833 to 30 June 1834.
Second session — 1 Dec. 1834 to 3 March 1835.
Senate — 20 Democrats; 6 State's Rights; 2 Nullifiers; 20 National Republicans.
House — 147 Democrats; 10 State's Rights; 7 Nullifiers; 43 National Republicans; 53 Anti-Masons.
Speakers — 1833–34, Andrew Stevenson (Va.), Democrat; 2 June 1834–35, John Bell (Tenn.), Democrat.

Twenty-fourth Congress

First session — 7 Dec. 1835 to 4 July 1836.
Second session — 5 Dec. 1836 to 3 March 1837
Senate — 27 Democrats; 25 Whigs.
House — 145 Democrats; 98 Whigs.
Speaker — James K. Polk (Tenn.), Democrat.

Twenty-fifth Congress

Special session of Senate — 4–10 March 1837.
First session — 4 Sept. to 16 Oct. 1837.
Second session — 4 Dec. 1837 to 9 July 1838.
Third session — 3 Dec. 1838 to 3 March 1839.
Senate — 30 Democrats; 3 Conservatives; 1 Nullifier; 18 Whigs.
House — 108 Democrats; 13 Conservatives; 11 Sub-Treasury Whigs; 107 Whigs.
Speaker — James K. Polk (Tenn.), Democrat.

Beginning with the 26th Congress, the various factions opposed to Van Buren united under the name Whig and for the next 16 years, despite all disturbing influences, the two-party system held sway. In the 27th and 28th Congresses a few members were known as Tylerites but were soon absorbed in the Democratic party, while in the next Congress appeared the Native Americans who represented a movement against foreigners in the larger cities (see American Party). From 1849 to 1855 Congress contained a number of Free-Soilers, or Free Democrats as they afterward called themselves, composed of about an equal number of former Whigs and Democrats.

Twenty-sixth Congress

First session — 2 Dec. 1839 to 21 July 1840.
Second session — 7 Dec. 1840 to 3 March 1841.
Senate — 28 Democrats; 22 Whigs.
House — 124 Democrats; 118 Whigs.
Speaker — R. M. T. Hunter (Va.), Democrat.

TWENTY-SEVENTH CONGRESS

Special session of Senate — 4–15 March 1841.
First session — 31 May to 13 Sept. 1841.
Second session — 6 Dec. 1841 to 31 Aug. 1842.
Third session — 5 Dec. 1842 to 3 March 1843.
Senate — 28 Whigs; 22 Democrats; 2 Tylerites.
House — 133 Whigs; 102 Democrats; 6 Tylerites.
Speaker — John White (Ky.), Whig.

TWENTY-EIGHTH CONGRESS

First session — 4 Dec. 1843 to 17 June 1844.
Second session — 2 Dec. 1844 to 3 March 1845.
Senate — 25 Democrats; 28 Whigs; 1 Tylerite.
House — 142 Democrats; 79 Whigs; 1 Tylerite.
Speaker — John W. Jones (Va), Democrat; George W. Hopkins (Va.), pro tempore.

TWENTY-NINTH CONGRESS

Special session of Senate — 4–20 Marcn 1845.
First session — 1 Dec. 1845 to 10 Aug. 1846.
Second session — 7 Dec. 1846 to 3 March 1847.
Senate — 31 Democrats; 25 Whigs.
House — 143 Democrats; 77 Whigs; 6 Native Americans.
Speaker — John W. Davis (Ind.), Democrat.

THIRTIETH CONGRESS

First session — 6 Dec. 1847 to 14 Aug. 1848.
Second session — 4 Dec. 1848 to 3 March 1849.
Senate — 36 Democrats; 21 Whigs; 1 Independent.
House — 108 Democrats; 115 Whigs; 4 Independents.
Speaker — Robert C. Winthrop (Mass.), Whig.

THIRTY-FIRST CONGRESS

Special session of Senate — 5–23 March 1849.
First session — 3 Dec. 1849 to 30 Sept. 1850.
Second session — 2 Dec. 1850 to 3 March 1851.
Senate — 35 Democrats; 25 Whigs; 2 Free-Soilers.
House — 112 Democrats; 109 Whigs; 9 Free-Soilers.
Speaker — Howell Cobb (Ga.), Democrat; Robert C. Winthrop (Mass.), Whig, pro tempore.

THIRTY-SECOND CONGRESS

Special session of Senate — 4–13 March 1851.
First session — 1 Dec. 1851 to 31 Aug. 1852.
Second session — 6 Dec. 1852 to 3 March 1853.
Senate — 35 Democrats; 24 Whigs; 3 Free-Soilers.
House — 140 Democrats; 88 Whigs; 5 Free-Soilers.
Speaker — Linn Boyd (Ky.), Democrat.

THIRTY-THIRD CONGRESS

Special session of Senate — 4 March to 11 April 1853.
First session — 5 Dec. 1853 to 7 Aug. 1854.
Second session — 4 Dec. 1854 to 3 March 1855.
Senate — 38 Democrats; 22 Whigs; 2 Free-Soilers.
House — 159 Democrats; 71 Whigs; 4 Free-Soilers.
Speaker — Linn Boyd (Ky.), Democrat.

In 1854 the dispute over the Missouri Compromise (q.v.) caused a split in the Whig party, most of the Southern members and many of the Northern joining a new party called the American or Know-Nothing party. The other Northern Whigs, the Free-Soilers and a few Democrats united to form the new Republican party (q.v.). When the 34th Congress convened there was much confusion as to exact party adhesion but by the second session there were three fairly well-defined groups.

THIRTY-FOURTH CONGRESS

First session — 3 Dec. 1855 to 18 Aug. 1856.
Second session — 21–30 Aug. 1856.
Third session — 1 Dec. 1856 to 3 March 1857.
Senate — 40 Democrats; 15 Republicans; 5 Americans.
House — 83 Democrats; 108 Republicans; 43 Americans.
Speaker — Nathaniel P. Banks (Mass.), Republican.

In the 35th and 36th Congresses the Democratic party was rent by the dispute over admitting Kansas under the Lecompton Constitution (q.v.), Douglas's followers opposing the administration. When the Civil War broke out in 1861 a Union party made its appearance in the northern slave States, later spread to the free States and ultimately for a short time was united with the Republicans.

THIRTY-FIFTH CONGRESS

Special session of Senate — 4–14 March 1857.
First session — 7 Dec. 1857 to 14 June 1858.
Special session of Senate — 15–16 June 1858.
Second session — 6 Dec. 1858 to 3 March 1859.
Senate — 36 Democrats; 20 Republicans; 5 Americans; 3 Anti-Lecompton Democrats.
House — 118 Democrats; 92 Republicans; 15 Americans; 11 Anti-Lecompton Democrats.
Speaker — James L. Orr (S. C.), Democrat.

THIRTY-SIXTH CONGRESS

Special session of Senate — 4–10 March 1859.
First session — 5 Dec. 1859 to 25 June 1860.
Special session of Senate — 26–28 June 1860.
Second session — 3 Dec. 1860 to 2 March 1861.
Senate — 36 Democrats; 26 Republicans; 2 Americans; 2 Anti-Lecompton Democrats.
House — 92 Democrats; 114 Republicans; 24 Americans; 7 Anti-Lecompton Democrats.
Speaker — William Pennington (N. J.), Republican.

THIRTY-SEVENTH CONGRESS

Special session of Senate — 4–28 March 1861.
First session — 4 July to 6 Aug. 1861.
Second session — 2 Dec. 1861 to 17 July 1862.
Third session — 1 Dec. 1862 to 3 March 1863.
Senate — 31 Republicans; 10 Democrats; 8 Unionists.
House — 105 Republicans; 43 Democrats; 30 Unionists.
Speaker — Galusha A. Grow (Pa.), Republican.

THIRTY-EIGHTH CONGRESS

Special session of Senate — 4–14 March 1863.
First session — 7 Dec. 1863 to 4 July 1864.
Second session — 5 Dec. 1864 to 3 March 1865.
Senate — 36 Republicans; 9 Democrats; 5 Unionists.
House — 102 Republicans; 75 Democrats; 9 Unionists.
Speaker — Schuyler Colfax (Ind.), Unionist.

THIRTY-NINTH CONGRESS

Special session of Senate — 4–11 March 1865.
First session — 4 Dec. 1865 to 28 July 1866.
Second session — 3 Dec. 1866 to 2 March 1867.
Senate — 42 Unionists; 10 Democrats.
House — 149 Unionists; 42 Democrats.
Speaker — Schuyler Colfax (Ind.), Unionist.

The reconstruction question caused an upheaval in political as well as in social life and in the election of the 40th Congress caused a new party alignment, many who had been Unionists during the war period returning to the Democratic party, while the Republican party reappeared as an organization. Since that time the Republican and Democratic organizations have steadily opposed each other in the Congressional government of the country and every effort to destroy or supplant them has failed. After 1870 some Republicans who opposed Grant's administration formed the Liberal Republican party, and in 1872 joined the Democrats in an endeavor to prevent Grant's re-election. In 1876, however, most of the Liberals returned to the Republican ranks. In the 46th to the 49th Congresses were a group of Greenbackers of the so-called National party, and also a faction of Virginians called Readjusters, who ultimately were absorbed by the Republicans.

FORTIETH CONGRESS

Special session of Senate — 1–20 April 1867.
First session — 4–30 March, 3–20 July, 21 Nov. to 2 Dec. 1867.
Second session — 2 Dec. 1867 to 27 July, 21 Sept., 16 Oct., and 10 Nov. 1868.
Third session — 7 Dec. 1868 to 3 March 1869.
Senate — 42 Republicans; 11 Democrats.
House — 143 Republicans; 49 Democrats.
Speakers — Schuyler Colfax (Ind.), Republican; 3 March 1869, Theodore M. Pomeroy (N. Y.) Republican.

FORTY-FIRST CONGRESS

First session — 4 March to 10 April 1869.
Special session of Senate — 12–22 April 1869.
Second session — 6 Dec. 1869 to 15 July 1870.
Third session — 5 Dec. 1870 to 3 March 1871.
Senate — 56 Republicans; 11 Democrats.
House — 149 Republicans; 63 Democrats.
Speaker — James G. Blaine (Me.), Republican.

Forty-second Congress

First session — 4 March to 20 April 1871.
Special session of Senate — 10–27 May 1871.
Second session — 4 Dec. 1871 to 10 June 1872.
Third session — 2 Dec. 1872 to 3 March 1873.
Senate — 52 Republicans; 17 Democrats; 5 Liberals.
House — 134 Republicans; 104 Democrats; 5 Liberals.
Speaker — James G. Blaine (Me.), Republican.

Forty-third Congress

Special session of Senate — 4–26 March 1873.
First session — 1 Dec. 1873 to 23 June 1874.
Second session — 7 Dec. 1874 to 3 March 1875.
Senate — 49 Republicans; 19 Democrats; 5 Liberals
House — 194 Republicans; 92 Democrats; 14 Liberals.
Speaker — James G. Blaine (Me.), Republican.

Forty-fourth Congress

Special session of Senate — 5–24 March 1875.
First session — 6 Dec. 1875 to 15 Aug. 1876.
Second session — 4 Dec. 1876 to 4 March 1877.
Senate — 29 Democrats; 45 Republicans; 2 Liberals.
House — 169 Democrats; 109 Republicans; 14 Liberals.
Speakers — 1875–76, Michael C. Kerr (Ind.), Democrat; 4 Dec. 1876–77, Samuel J. Randall (Pa.), Democrat.

Forty-fifth Congress

Special session of Senate — 5–17 March 1877.
First session — 15 Oct. to 3 Dec. 1877.
Second session — 3 Dec. 1877 to 20 June 1878.
Third session — 2 Dec. 1878 to 3 March 1879.
Senate — 36 Democrats; 39 Republicans; 1 Independent.
House — 153 Democrats; 140 Republicans.
Speaker — Samuel J. Randall (Pa.), Democrat.

Forty-sixth Congress

First session — 18 March to 1 July 1879.
Second session — 1 Dec. 1879 to 16 June 1880.
Third session — 6 Dec. 1880 to 3 March 1881.
Senate — 42 Democrats; 33 Republicans; 1 Independent.
House — 149 Democrats; 130 Republicans; 14 Nationalists.
Speaker — Samuel J. Randall (Pa.), Democrat.

Forty-seventh Congress

Special session of Senate — 4 March to 20 May 1881.
Special session of Senate — 10–29 Oct. 1881.
First session — 5 Dec. 1881 to 8 Aug. 1882.
Second session — 4 Dec. 1882 to 3 March 1883.
Senate — 37 Republicans; 37 Democrats; 1 Independent.
House — 147 Republicans; 135 Democrats; 9 Nationalists; 2 Readjusters.
Speaker — J. Warren Keifer (Ohio), Republican.

Forty-eighth Congress

First session — 3 Dec. 1883 to 7 July 1884.
Second session — 1 Dec. 1884 to 3 March 1885.
Senate — 36 Democrats; 38 Republicans; 2 Readjusters.
House — 197 Democrats; 118 Republicans; 5 Readjusters; 4 Independents; 1 Nationalist.
Speaker — John G. Carlisle (Ky.), Democrat.

Forty-ninth Congress

Special session of Senate — 4 March to 2 April 1885.
First session — 7 Dec. 1885 to 5 Aug. 1886.
Second session — 6 Dec. 1886 to 3 March 1887.
Senate — 34 Democrats; 43 Republicans.
House — 183 Democrats; 140 Republicans; 2 Nationalists.
Speaker — John G. Carlisle (Ky.), Democrat.

Fiftieth Congress

First session — 5 Dec. 1887 to 20 Oct. 1888.
Second session — 3 Dec. 1888 to 2 March 1889.
Senate — 37 Democrats; 39 Republicans.
House — 169 Democrats; 152 Republicans; 2 Labor; 2 Independents.
Speaker — John G. Carlisle (Ky.), Democrat.

Fifty-first Congress

Special session of Senate — 4 March to 2 April 1889.
First session — 2 Dec. 1889 to 1 Oct. 1890.
Second session — 1 Dec. 1890 to 3 March 1891.
Senate — 39 Republicans; 37 Democrats.
House — 166 Republicans; 159 Democrats.
Speaker — Thomas B. Reed (Me.), Republican.

Beginning with 1890 the Farmers' Alliance movement, culminating in the People's party, or Populists, disturbed the balance of Republicans and Democrats, and, to add to the confusion, the question of the free coinage of silver was injected into political discussions, so that the two large parties were much cut up, there being Gold Democrats and Silver Republicans. Hence the task of determining the party affiliations of those elected by fusion to these Congresses is very difficult since the claims of partisans vary widely, as do also all contemporaneous statements. But when the free silver issue had been abandoned, the scattered elements again entered the parties of which they had previously been members, and nothing arose to disturb this party alignment until the so-called Bull Moose movement of 1912, when the Republican party was split by the formation of the Progressive party. While the Progressive candidate Roosevelt received 88 electoral votes against eight for the Republican candidate, Taft, the Progressive party had not sufficient strength in Congress materially to influence legislation. In the election of 1916 large numbers of the Progressive voters returned to the Republican party.

Fifty-second Congress

First session — 7 Dec. 1891 to 5 Aug. 1892.
Second session — 5 Dec. 1892 to 3 March 1893.
Senate — 39 Democrats; 47 Republicans; 2 Populists.
House — 235 Democrats; 88 Republicans; 9 Populists.
Speaker — Charles F. Crisp (Ga.), Democrat.

Fifty-third Congress

Special session of Senate — 4 March to 15 April 1893.
First session — 7 Aug. to 3 Nov. 1893.
Second session — 4 Dec. 1893 to 28 Aug. 1894.
Third session — 3 Dec. 1894 to 2 March 1895.
Senate — 44 Democrats; 38 Republicans; 3 Populists.
House — 218 Democrats; 127 Republicans; 11 Populists.
Speaker — Charles F. Crisp (Ga.), Democrat.

Fifty-fourth Congress

First session — 2 Dec. 1895 to 11 June 1896.
Second session — 7 Dec. 1896 to 3 March 1897.
Senate — 43 Republicans; 39 Democrats; 6 Populists.
House — 244 Republicans; 105 Democrats; 6 Populists; 1 Silver.
Speaker — Thomas B. Reed (Me.), Republican.

Fifty-fifth Congress

Special session of Senate — 4–10 March 1897.
First session — 15 March to 24 July 1897.
Second session — 6 Dec. 1897 to 8 July 1898.
Third session — 5 Dec. 1898 to 3 March 1899.
Senate — 47 Republicans; 34 Democrats; 5 Populists; 2 Silver.
House — 204 Republicans; 113 Democrats; 11 Populists; 3 Silver; 26 Fusionists (Democrats and Populists).
Speaker — Thomas B. Reed (Me.), Republican.

Fifty-sixth Congress

First session — 4 Dec. 1899 to 7 June 1900.
Second session — 3 Dec. 1900 to 2 March 1901.
Senate — 53 Republicans; 26 Democrats; 5 Populists; 2 Silver; 1 Independent.
House — 185 Republicans; 163 Democrats; 7 Populists; 2 Silver.
Speaker — David B. Henderson (Iowa), Republican.

Fifty-seventh Congress

Special session of Senate — 4–9 March 1901.
First session — 2 Dec. 1901 to 1 July 1902.
Second session — 1 Dec. 1902 to 4 March 1903.
Senate — 55 Republicans; 31 Democrats; 4 Populists or Silverites.
House — 197 Republicans; 151 Democrats; 9 Fusionists.
Speaker — David B. Henderson (Iowa), Republican.

Fifty-eighth Congress

Special session of Senate — 5–19 March 1903.
First session — 9 Nov. to 7 Dec. 1903.
Second session — 7 Dec. 1903 to 28 April 1904.
Third session — 5 Dec. 1904 to 4 March 1905.
Senate — 57 Republicans; 33 Democrats.
House — 208 Republicans; 178 Democrats.
Speaker — Joseph G. Cannon (Ill.), Republican.

Fifty-ninth Congress

Special session — 4–18 March 1905.
First session — 4 Dec. 1905 to 30 June 1906.
Second session — 3 Dec. 1906 to 4 March 1907.
Senate — 57 Republicans; 33 Democrats.
House — 250 Republicans; 136 Democrats.
Speaker — Joseph G. Cannon (Ill.), Republican.

Sixtieth Congress

First session — 2 Dec. 1907 to 30 May 1908.
Second session — 7 Dec. 1908 to 4 March 1909.
Senate — 61 Republicans; 31 Democrats.
House — 222 Republicans; 164 Democrats.
Speaker — Joseph G. Cannon (Ill.), Republican.

Sixty-first Congress

Special session of Senate — 4–6 March 1909.
First session — 15 March to 5 Aug. 1909.
Second session — 6 Dec. 1909 to 25 June 1910.
Third session — 5 Dec. 1910 to 4 March 1911.
Senate — 61 Republicans; 32 Democrats.
House — 219 Republicans; 172 Democrats.
Speaker — Joseph G. Cannon (Ill.), Republican.

Sixty-second Congress

First session — 4 April to 22 Aug. 1911.
Second session — 4 Dec. 1911 to 26 Aug. 1912.
Third session — 2 Dec. 1912 to 4 March 1913.
Senate — 41 Democrats; 51 Republicans.
House — 228 Democrats; 161 Republicans; 1 Socialist.
Speaker — Champ Clark (Mo.), Democrat.

Sixty-third Congress

Special Session of Senate — 4–17 March 1913.
First session — 7 April to 1 Dec. 1913
Second session — 1 Dec. 1913 to 24 Oct. 1914.
Third session — 7 Dec. 1914 to 4 March 1915.
Senate — 51 Democrats; 44 Republicans; 1 Progessive.
House — 291 Democrats; 127 Republicans; 9 Progressives; 7 Progressive Republicans; 1 Independent.
Speaker — Champ Clark (Mo.), Democrat.

Sixty-fourth Congress

First session — 6 Dec. 1915 to 8 Sept. 1916.
Second Session — 4 Dec. 1916 to 4 March 1917.
Senate — 56 Democrats; 40 Republicans.
House — 230 Democrats; 196 Republicans; 7 Progressives; 1 Socialist; 1 Independent.
Speaker — Champ Clark (Mo.), Democrat.

Sixty-fifth Congress

Special Session — 5 March 1917 to 16 March 1917.
First Session — 2 April 1917 to 6 Oct. 1917.
Second Session — 3 Dec. 1917.
Senate — 53 Democrats; 42 Republicans.
House — 216 Democrats; 210 Republicans; 2 Progressives; 1 Prohibitionist; 1 Socialist; 2 Independent.
Speaker — Champ Clark (Mo.), Democrat.

Bibliography.— Article by Theodore Clarke Smith, in McLaughlin and Hart, ‹Cyclopedia of American Government › (Vol. I, pp. 388–392, New York 1914) on which the above data regarding party alignments is based; Niles, Hezekiah, ‹Weekly Register› (1811–49); Poore, B: P., ‹Political Register and Congressional Directory› (1878); ‹Congressional Directory› (1870 to date); ‹Annals of Congress›; ‹Register of Debates in Congress›; *Congressional Globe; Congressional Record;* Senate and House ‹Journals›; and the various annual ‹Almanacs.› The party divisions differ in all publications.

Irving E. Rines,
Author of ‹History of the United States›.

CONGRESSIONAL DISTRICT. See District.

CONGRESSIONAL RECORD, a journal of the proceedings of the Congress of the United States, dating from 1799. Prior to that date the Senate held secret sessions only, but thereafter publication was required, save in the case of «executive sessions.» *Record* has been the title since 1875; before that date the journal was entitled *Annals of Congress* (1789–99 for the House, and 1799–1824 for both branches), *Register of Debates* until 1837, and until the end of 1874 *Congressional Globe,* and since then, its present name has been in use. Undelivered speeches on the grant of «permission to print» appear in the *Record* as if they had actually been given, and stenographic reports of debates are revised by the participants before being printed.

CONGRESSMAN AT LARGE, a national representative elected by the entire State and not as a member for some district. There is no permanent system of the sort, though many able political thinkers have wished for it and believed it would greatly raise the average of ability in the House; preventing the restriction of choice to the mediocre notabilities who chance to reside in a given district. In fact, however, there is no legal obstacle now to the voters of a district electing an outsider if they wish; but they rarely wish it, and if the general system were introduced, the experience of other political affairs makes it probable that the memberships would be «claimed» by given districts in rotation. At present, the only use of the plan is in giving a State the fresh memberships assigned to it by the apportionment under a new census, until it can be redistricted, which is sometimes a long process with fierce political opposition. Many States have had one congressman at large, and some two.

CONGREVE, kŏn′grēv, **Richard,** English essayist: b. Leamington, England, 4 Sept. 1818; d. Hampstead, England, 5 July 1899. He was educated at Rugby and Oxford and was subsequently a tutor in Wadham College, Oxford, resigning his post on becoming a Positivist. Beside editing Aristotle's ‹Politics› with notes (1855), he published ‹Roman Empire of the West› (1855); ‹The Catechism of the Positive Religion› (1858); ‹Elizabeth of England› (1862); ‹Essays: Political, Social, and Religious› (1874).

CONGREVE, William, English dramatist: b. Bardsey, near Leeds, 1670; d. London, 19 Jan. 1729. He entered the Middle Temple, London, to prepare himself for the legal profession, but soon deserted the law for literature. At a very early age he wrote a novel entitled ‹Incognita,› followed by his comedy of the ‹Old Bachelor,› produced in 1693, and pronounced by Dryden the greatest first play that he had ever beheld. His next play, the ‹Double Dealer› (1693), was not so successful in representation; but his third, the comedy of ‹Love for Love› (1695), proved extremely popular. Its success acquired for the author the patronage of Lord Halifax, who conferred on him several very lucrative posts, so that he was far more prosperous than most men of letters. Not content with his fame in comedy, he essayed tragedy; and in 1697 produced his ‹Mourning Bride,› the reception of which was extremely favorable. The composition of four such plays before he had attained the age of 28 is a remarkable proof of early genius in a line of composition demanding great observation and experience. The licentiousness of his writings caused him to be attacked by Jeremy Collier in his ‹Short View of the Immorality and Profaneness of the English Stage,› to which Congreve published a lame and ineffective reply. He soon after closed his dramatic career with the ‹Way of the World› (1700), considered by many critics as the most perfect of his comedies, but which was received so coldly that he resentfully determined to relinquish a species of writing in which, upon the whole, he had been eminently successful. A masque, entitled the ‹Judgment of Paris,› and

'Semele,' an opera, neither of which was presented, close the list of his labors for the stage. He, however, continued to write occasional verses on public subjects; and in 1710 published a collection of his plays and poems. Dryden declared him to be the equal of Shakespeare. Steele dedicated to him his 'Miscellanies,' and Pope his translation of the Iliad. He was buried in Westminster Abbey, where a monument was erected to him by the Duchess of Marlborough. Congreve's comedies are chiefly distinguished for the sustained flow of wit in the dialogue. But his characters are repulsive. It is now rare for any of his plays to be produced on the stage, which without rigorous pruning, to adapt them to modern manners, it would be impossible to do. His poetry is of little value. (See WAY OF THE WORLD, THE). Consult Macaulay, 'Comic Dramatists of the Restoration'; Hazlitt, 'Lectures on the English Comic Writers'; Gosse, 'Life of Congreve' (1888).

CONGREVE, SIR **William,** English inventor: b. 20 May 1772; d. Toulouse, France, 16 May 1828. After passing through the Royal Academy at Woolwich he entered the artillery in 1791, served under his father, a lieutenant-general, and in 1814 succeeded him in his post of comptroller, and also as second holder of the baronetcy, conferred in 1812. He invented the rocket which bears his name about 1804. It was first used in active service in the attack on Boulogne, 1806, and on Copenhagen 1807. He took an active part in army improvements; became a Fellow of the Royal Society in 1811; obtained a patent for manufacturing gunpowder in 1815; and one for the manufacture of bank-note paper in 1819.

CONGRUISM, CONGRUIST, terms derived from the expression *meritum e congruo,* which signifies the view of some writers on the doctrine of divine grace and human merit, that though a man may not in the strict sense merit a given grace or favor of God he may be said to merit in a looser sense, on the ground that there is a certain congruity, a certain fitness with what we believe concerning the relation between man and his Creator, in assuming that the Creator will, out of his infinite mercy, grant to his faithful servants favors that they do not in any tolerable sense of the word merit. An example of *meritum e congruo* is had when a saintly man by his prayers obtains the conversion of a sinner: that conversion is not merited at all in any strict sense; but it is congruous, it is what we like to think about the Creator's love for his chosen ones, that he should be moved to grant the petition of one who is admitted to his friendship.

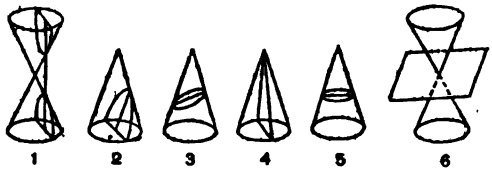
CONHYDRIN, kŏn-hī'drĭn, an alkaloid contained, along with conia, in the flowers and seeds of the hemlock. The physiological action of conhydrin resembles that of conia (q.v.), but it is not nearly so rapid or powerful.

CONI, kō'nē, or **CUNEO,** koo-nā'ō, Italy, capital of the province and district of Coni, on a high hill, at the confluence of the Stura and the Gesso, about 55 miles south of Turin, in a pleasant, well-cultivated district. The old fortifications, the arcades along the principal street, a Franciscan church of the 12th century, a handsome town-house, with a tall tower, and a cathedral, are the picturesque items of the town. There are silk spinning-mills, and manufactures of silk, paper and woolen goods. Grain, hemp and silk form articles of commerce. It was taken by Napoleon in 1796, by the Austrians in 1799, and again given up to the French in 1801. Pop. 29,122.

CONIA, or **CONIINE** ($C_8H_{17}N$), an alkaloid in the hemlock, discovered in an impure state by Giesecke in 1827, and subsequently prepared in the pure state by Geiger, who recognized it as a vegetable base. It exists, combined with malic acid, in all parts of the plant, but especially in the not quite ripe seed. When pure it is a colorless oily liquid, specific gravity 0.89, which changes by exposure to air to a brown fluid, and ultimately to a resinous, bitter mass, slightly soluble in water, soluble in alcohol, and when purified yielding a jelly with a butyric odor. It can be distilled without much alteration, provided the air be excluded, its boiling-point being 168° C. At a higher temperature it burns with a bright smoky flame. It is slightly volatile even at ordinary temperatures. It has a very disagreeable odor, sharp and choking when strong; its taste is nauseous. It is somewhat soluble in water, readily in alcohol, ether and oils, and itself acts as a solvent of sulphur. It has a strong alkaline reaction when moist, and combines with the acids to form salts, most of which are crystalline but deliquescent. The salts are unstable in aqueous solution; they evolve the odor of the base and gradually change color. It precipitates the oxides of iron, zinc, manganese, aluminum, copper and the other heavy metals, from solutions of their salts. It is attacked by chlorine, bromine and iodine, and oxidized by nitric acid, yielding butyric acid. The poisonous action of conia has been minutely investigated, but although it has been proved to be rapidly fatal to all classes of animals when administered in doses of from 3 or 4 to 10 or 12 grains, the nature of its action is not fully ascertained; but the breathing and pulse are affected, and the extremities paralyzed. Some experimenters have tried its effect upon themselves, and according to their account the minutest doses produce burning in the mouth, salivation, nausea and vomiting, pressure in the head, tottering, indistinct vision, cramps and other symptoms. Similar observations have been made on persons to whom the alkaloid has been given therapeutically. It has been shown that conia can be detected in a poisoned animal, even after a considerable time. The tonic power of conia seems to be little if at all affected by the introduction into it of the alcoholic radicals, methyl, and ethyl. The action is perhaps not so rapid, but it is the same in character, and takes place with quite as small quantities. In this respect conia differs from some other alkaloids, for instance, codeia.

CONIBO, kō-nē'bō, a tribe of Indians belonging to the Panoan family in eastern Peru, allied to the Ucayali tribe. They were an agricultural people and built villages. The Spanish missionaries tried to convert them in 1683, but were driven out after 1695, when Father Ritchie was killed by the savages. They are now partially civilized and are often employed as canoe men and rubber gatherers. Their country is along the middle Ucayali River in northeastern Peru. Along the river they are given to fishing; but those back from the water are, many of them, gatherers of sarsaparilla.

CONIC SECTIONS, three curves, the hyperbola, the parabola and the ellipse, are called the conic sections, because these curves are formed by the intersection of the surface of a cone with planes that cut the cone in various directions. If the cutting-plane be parallel to the axis of the cone (fig. 1), the curve formed is the hyperbola, which has two branches, as shown in the figure. If the cutting-plane be parallel to a straight line on the surface of the cone (fig. 2), the curve formed is a parabola. Any other section is an ellipse (fig. 3). It must be noticed, however, that this general description includes three peculiar cases. In the case of a plane parallel to the axis of the cone, when that plane contains the axis, the section, instead of being a hyperbola, is in this limiting case a pair of straight lines meeting each other at an angle equal to that of the angle of the cone so as to form a triangle (fig. 4). When a plane, which would otherwise form a parabolic section, is a tangent plane to the cone, the parabola degenerates into a straight line passing through the vertex of the cone. Lastly, when a plane that would otherwise form an ellipse is perpendicular to the axis of the cone, the ellipse becomes a circle (fig. 5). Lastly, when a plane cuts the cone only in the vertex, the conic section degenerates into a single point (fig. 6). A pair of points cannot be produced by any plane section of a cone, but on account of its analytical properties, this figure is also considered as a degenerate conic section. The properties of these curves are discussed under their several names. It will there be seen that other definitions may be given of the curves; and that from these their properties are more conveniently derived than from the consideration that they are formed by the sections of a conical surface. The most important of these properties are that of being represented in a system of Cartesian co-ordinates by an equation of the second degree, and that of being the locus of the corresponding lines of two projective pencils in the plane. The properties of these curves are of the greatest physical interest; and the geometry of the conic sections has, ever since the time of the Greek mathematicians, been considered as the best of the more advanced geometrical studies.



CONIFERÆ, a group of trees and shrubs consisting of about 40 genera and 300 species, which are most numerous in the temperate regions of the world, especially in the northern hemisphere. Among the few species found in the tropics, the most important are those belonging to the genera *Araucaria* (q.v.), *Dammara*, *Phyllocladus* and *Dacrydium*. In the Arctic regions and the correspondingly cold mountain climates various conifers approach very nearly the line of perpetual snow, and like other plants of such climates are reduced to gnarly dwarfed specimens which bear but slight resemblance to those of the same species in less rigorous climates. In the United States and Canada about 15 genera and 100 species and sub-species are indigenous and of these the majority are native to the Pacific coast. In addition to the number of species mentioned fully 400 horticultural varieties must be added. These are listed in Bulletin No. 17 of the Division of Forestry, United States Department of Agriculture.

No forest trees are of more economic importance than the conifers. Their notable blending of maximum strength, stiffness, and durability with minimum weight, and their abundance have won them prominence in house, ship and bridge building, wharf making and sidewalk constructing, etc. They are also of great importance in planting, both for use and ornament, their evergreen habit (except in *Larix*) and the retention of their lower limbs until comparative age, making them especially good for wind breaks, these characters coupled with their conical form and the striking colors of their foliage rendering them particularly useful for grouping with deciduous trees and shrubs or for individual specimens in parks and upon lawns.

The species are characterized by straight shafts which elongate terminally, and, like the shape of the trees, form a more or less attenuated cone. They have either needle-shaped or awl-shaped leaves (except in *Podocarpus*) which are specially adapted by these forms and by the thickened epidermis to resist excessive transpiration, a necessary adaptation since the leaves are usually retained throughout the year. They have naked ovules which are fertilized directly by the exceedingly light pollen which is produced in enormous quantities and carried by the wind even miles away from the forests, to fall as so-called “showers of sulphur.” These ovules are borne in a strobile which enlarges after fertilization into what is popularly known as the cone, the group being named from this character. The cone is an aggregation of scales, above the bases of which are borne the seeds. These are in some species utilized as food, and have been introduced in the markets of the United States by the Syrians. The internal structure of the *conifers* is also peculiar to the group. Like the dicotyledons, the woody cylinder increases in girth by the external development, beneath the bark, of homogeneous woody fibres marked on two sides with circular discs and among which are few true vessels. Since these woody fibres are fitted together without overlapping, the grain of the wood is fine and uniform, which accounts for its easy working qualities, especially in the direction of the “grain.”

Botanists divide the species into two great families, the *Taxaceæ* and *Pinaceæ*. The former includes two tribes, *Podocarpeæ*, the leading genus of which is *Podocarpus*, with about 40 species, and *Taxeæ*, chief of which is the genus *Taxus*, the yew. The species of this family have more or less fleshy fruits. The *Pinaceæ* embraces four tribes: *Abieteæ*, the pine family proper, of which the principal genera are *Pinus*, pine; *Picea*, spruce; *Tsuga*, hemlock; *Abies*, fir; and *Larix*, larch; *Taxodieæ* which includes *Taxodium*, the bald cypress; and *Sequoia*, the redwood; *Cupressineæ*, which includes *Thuya*, arborvitæ; and *Juniperus*, juniper; *Chamæcyparis*, cedar; *Araucarinæ*, including *Araucaria*, Norfolk Island pine and its allies. The most widely distributed of these groups are undoubtedly the genera *Pinus* and *Juniperus*, and the most restricted are *Taxodium*, two species of which are indigenous to the United States and one to China; and *Sequoia*, of which only two species are known, both found in occasional groves on the Pacific Coast. During geological ages these two genera were far more widely distributed.

So far as is known from fossils conifers appeared on the earth in Silurian time, though they may have appeared earlier. They increased and developed during the Devonian and Carboniferous ages. Unlike the acrogens (ferns, ground-pines and horse-tail rushes); the conifers have increased rather than declined since the Carboniferous. Species of yew were abundant in North America in early Devonian time. In the Carboniferous the gymnosperms that grew in the great swamps were related to the cycads and yews. True conifers may have grown upon the drier hillsides. The genus *Walchia* began near the close of the Carboniferous, and in the Permian the conifers included species of *Dadoxylon*, *Pinites*, *Ullmania*, etc.; common Triassic conifers are the genera *Voltzia*, *Baiera* and *Araucarites*.

Conifers are propagated by means of seeds which may usually be obtained in autumn, though some species open their cones at irregular intervals through the winter and others only when artificial heat such as that of a forest fire is applied. The seed should be planted in a sandy loam, given a light mulch, of pine needles or sphagnum, and the seedlings kept free from weeds. They must be kept moist but not wet until they have formed their crown buds, which appear when they are about three months old. If proper methods are practised, transplanting may be done at any time of year, but spring is generally much the best season, since the roots are then most active and the check to growth is least. As a rule conifers do best upon light soils. They are attacked by a large number of insects and diseases both in foliage and trunk, but since these trees and shrubs are planted mainly for ornament or are growing in the forest where systematic war cannot often be successfully carried on, little attention has been given to the control of these pests. Standard fungicides and insecticides may be used effectively in some cases, care being taken to determine the mode of attack of the particular pest. Consult Veitch, 'Manual of Conifers'; Beissner, 'Handbuch der Nadelholzkunde'; Carrière, 'Traité des conifères'; Bailey, 'Standard Cyclopedia of Horticulture.'

CONIINE, CONEINE or **CONNIE.** See Conia.

CONINGSBY, a novel by Benjamin Disraeli, Lord Beaconsfield, published 1844. It was his sixth and most successful novel. In three months it had gone through three editions, and 50,000 copies had been sold in England and the United States. It was a novel with a purpose; the author himself explained that his aim was to elevate the tone of public life, to ascertain the true character of political parties and especially to vindicate the claims of the Tories. Incidentally he wished to emphasize the importance of the Church in the development of England, and he tried to do some justice to the Jews. There are more than threescore characters in the book, and part of its popularity came from people's interest in identifying them with men and women prominent in English social and political life.

CONINGTON, John, English classical scholar: b. Boston, Lincolnshire, 10 Aug. 1825; d. there, 23 Aug. 1869. He was educated at Beverley, Rugby, and Oxford, and in 1854 was appointed to the newly founded chair of Latin language and literature at Oxford, which he filled until his death. His greatest work is his edition of 'Virgil' (3 vols., 1861–68), with its singularly subtle and suggestive essays. His edition of the 'Agamemnon' (1848), and 'Choëphori' (1857), of Æschylus are of less moment, though indeed the latter is admirable. In his later years he gave himself much to translation, the results of which were his metrical versions of the 'Odes' of Horace (1863), the 'Æneid' (1866), in Scott's ballad-metre, the 'Iliad' (1868), in the Spenserian stanza, and the 'Satires and Epistles' of Horace (1869), in the couplet of Pope. His writings (with a memoir by H. J. Smith) were edited by J. A. Symonds (London 1872).

CONISTON LAKE, England, a lake in North Lancashire at the eastern foot of the Coniston Fells, nine miles west of Bowness on Windermere. It is five miles long, one-half mile broad, 147 feet above the sea, and its greatest depth is 260 feet. Its waters abound with trout and perch. On the eastern shore stand Ruskin's home, Brantwood and Tent House, once Tennyson's residence. The Old Man of Coniston, to the northwest, is 2,633 feet high.

CONIUM ("spotted hemlock"), the full-grown fruit of *Conium maculatum* gathered while green. *Conium maculatum* is a stout, erect biennial, three to six feet high, with a much branching, smooth, furrowed, dark green hollow stem, covered with purplish spots, very widely present throughout Europe and naturalized in the eastern United States. It grows commonly in wet places, wayside brooks, swamps and dark, moist gardens. All parts of the spotted hemlock are active, but the poisonous principle coniine is found most abundantly in the full-grown but unripe seed, the principle being a volatile alkaloid. Only fresh hemlock is of any service, and much of the lack of uniformity of results in the use of this drug as a remedy has come from the neglect of this precaution on the part of the manufacturers of the drug. The composition of conium is complex. It contains a slight amount of volatile oil and two or three alkaloids, the most important of which is coniine. Coniine is present in small amounts only. It is a strongly basic, colorless, oily liquid, with a penetrating odor and a sharp taste resembling tobacco. It boils at 166° C.; its chemical formula is $C_5H_{10}NH,CH_2CH_2CH_3$. It has been made synthetically, being one of the first of the alkaloids thus synthetized. The physiological action of conium is practically identical with the action of coniine. The general effect is paralysis of the motor end organs of voluntary muscles; it is thus a motor depressant. It is an irritant to the stomach, increasing the salivary secretions. Its effect on the heart is slight; its effect on the nervous system is very little save in extreme poisoning, when blood changes cause changes in the nervous system. The early symptoms of poisoning are heaviness of the muscles of the legs, and of the eyelids, ptosis, staggering gait, muscular relaxation and muscular paralysis; paralysis of the vocal chords causing derangement of speech; dilatation of the pupil; and finally paralysis of the muscles of respiration with asphyxia, convulsions and death. Treatment of the poisoning is by means of the stomach-pump, strychnine, coffee. Alcohol and rapid elimination by hot baths are desirable.

The therapeutics of conium is restricted. It is very questionable whether it is of use in any affection other than habitual motor spasms of voluntary origin such as spasmodic tics, torticollis and other like affections. It is certainly of very little value in spasmodic affections not associated with voluntary action such as chorea, epilepsy, myoclonus, etc.

CONJEVERAM, kŏn-jē-vėr-ŭm′, **CANCHIPURA** («the Golden City»), a town of Hindustan, in the presidency of Madras, district of Chinglepat. It stands in a valley, is irregularly built, and from five to six miles long, resembling a series of villages, intermingled with gardens and cocoanut plantations. Conjeveram is one of the Hindu sacred cities, and is sometimes called the «Benares of the south.» There are here two splendid pagodas; one dedicated to Vishnu, richly sculptured, and highly venerated; the other, a larger and more imposing structure, dedicated to Siva, from the summit of which a magnificent view is obtained. There are many smaller pagodas; and houses of accommodation for travelers abound. Cottons are manufactured. There is a flourishing school here connected with the Free Church of Scotland. Pop. 43,000.

CONJUGAL RIGHTS (Lat. *conjugalis,* «husband» or «wife»), *in law,* the right which husband and wife have to each other's society, comfort and affection. The suit for restitution of conjugal rights is a matrimonial suit, cognizable in the Divorce Court, which may be brought whenever either the husband or wife lives separate from the other without any sufficient reason. Conjugal rights are matrimonial, nuptial and connubial.

CONJUGATE FOCUS. See LENS.

CONJUGATION (Fr. *conjugation,* Lat. *conjugatio,* «joining together»). In some unicellular plants and in one-celled animals (*Protozoa*), after multiplying by self-division perhaps for many generations, reproduction by germs is brought about by a process called conjugation. It may be illustrated by a flagellate monad (*Heteromita*). In this form two individuals come together and completely fuse, the result is a thin-walled sac (the zygote), the protoplasm of which divides by multiple fission into very minute spores or germs. Each of these spores finally grows to become an adult *Heteromita.* In a much more specialized protozoan (*Paramœcium*), after self-division has been repeated for a certain number of generations, it is interrupted by conjugation. In this case two individuals become applied by their ventral faces, but do not fuse, but the nuclei melt together, so that the fusion of the two individuals takes place, after which the two original infusorians separate. This process is akin to and anticipates sexual reproduction in animals higher than protozoa. The process seems to lend new life to the species; it is a process of rejuvenescence, and is necessary for the maintenance of the life and vigor of the species.

CONJUNCTION, *in astronomy,* one of the aspects of the planets. Two heavenly bodies are in conjunction when they have the same longitude — that is, when the same perpendicular to the ecliptic passes through both. If they have, at the same time, the same latitude — that is, if they are both equally far north or south of the ecliptic — they appear from the earth to be in the same spot of the heavens, and to cover one another. The sun and moon are in conjunction at the period of new moon. In the case of the inferior planets Mercury and Venus, the conjunction is inferior when the planet is between the earth and the sun, and superior when the sun is between the earth and the planet. In general, a heavenly body is in conjunction with the sun when it is on the same side of the earth, and in a line with the sun, and it is in opposition to the sun when it is on the opposite side of the earth, the earth being in a line between it and the sun. Planets are invisible when in conjunction with the sun, except in rare cases when an inferior planet passes over the sun's disc, and may be seen as a speck on his surface. Conjunctions are either geocentric or heliocentric, according as they are actually witnessed from the earth, or as they would be witnessed if observed from the sun. In observing a conjunction from the earth's surface it is usual to reduce the observation to what it would be if made from the earth's centre; by this means the exact times of conjunction are more accurately fixed, and the observations of one astronomer made available to every other, wherever he may be on the earth's surface. Grand conjunctions occur when several stars or planets are found together. Chinese history records one about 2500 B.C., which astronomers calculate actually took place.

CONJUNCTION, that grammatical part of speech which couples words, clauses and propositions. Conjunctions differ from prepositions in their mode of affecting the cases of the nouns which they connect with the previous word or phrase. The preposition is said to govern the noun, that is, to determine its case; the conjunction also may determine the case of a noun, but in a different manner; it always requires the case of the noun or pronoun which follows it to be the same as that of the noun with which it connects the second noun. The conjunction also affects actively the modes of verbs, though less frequently in English than in other languages. Conjunctions are divided into those that co-ordinate the clauses they relate, such as «and,» «or,» «but,» and those that render one clause subordinate to the other, as «if,» «for,» «when,» «notwithstanding that.»

CONJUNCTIVA DISEASES. See EYE.

CONJUNCTIVITIS. See EYE.

CONJURATION (Lat. *conjuratio*, «a swearing together,» hence conspiracy), a conspiracy, plot or league for criminal ends; the act of calling or invoking by a sacred name; solemn entreaty; *in law*, an unlawful compact formed by oath. The term was formerly used especially in the sense of having personal conference with the devil or some evil spirit to discover secrets or effect some malicious purpose. Closely connected with this use of the word is the secondary meaning of a magical form of words used to invoke supernatural aid through incantation, enchantment or magic spell.

CONJURING, the production of effects apparently miraculous by natural means. The earlier professors of the art claimed bona fide supernatural powers; and in ages when the most elementary principles of physical science were unknown beyond a very limited circle, it was not difficult to gain credence for such a pretension. The modern conjurer makes no such claim, but tells the public frankly that his marvels are illusory. Of the conjurers of remote antiquity we have few reliable records; though it is a tolerably safe conjecture that the prestige of the ancient mysteries rested in no small degree upon effects of natural magic. Perhaps the earliest really trustworthy authority is Reginald Scot, who in his 'Discoverie of Witchcraft' (1584) has enumerated the stock feats of the conjurers of his day.

The conjurers of Scot's time, and those of even much later date, were accustomed, in order to facilitate the substitutions on which a great part of their tricks depended, to wear an apron with pockets, known (from its resemblance to a game-bag) as the *gibecière*. A later school suppressed this tell-tale article of costume, and used instead a table, with cover reaching nearly or quite to the ground. This table concealed an assistant, who worked most of the required transformations, etc., either handing the needful articles to the conjurer as he passed behind the table, or pushing them up through traps in the table-top. Conus the elder, a French conjurer who flourished at the close of the 18th century, made a further improvement by discarding the concealed assistant, and using an undraped table with a secret shelf (now known as the *servante*) behind it, on which his substitutions were made. His immediate competitors did not follow his example, a whole generation of later conjurers, including Comte, Bosco and Philippe, retaining the suggestive draped table. Its death-blow, however, was struck by Robert Houdin (1805–71), with whom about 1844 a new era began. The most modern school of conjurers, following the lead of Wiljalba Frikell, etc., represented by Hartz, Herrmann, Buatier de Kolta, Verbeck, Lynn, Bertram, etc., generally aim at producing their magical results with the minimum of visible apparatus.

The word «conjuring» also still bears all the meanings of *conjuration;* the sense in which the ancient conjurer always used it; and in which medicine men of savage tribes invariably use it to-day.

CONKLIN, Edwin Grant, American zoologist: b. 24 Nov. 1863. Graduated Ohio Wesleyan University (S.B. 1885, A.B. 1886, A.M. 1889, Hon. Sc.D. 1910), Johns Hopkins University (Ph.D. 1891), University of Pennsylvania (Hon. ScD. 1908); trustee Marine Biological Laboratory 1897—; professor of biology Ohio Wesleyan University 1891–94; professor of zoology Northwestern University 1894–96; professor of zoology University of Pennsylvania 1896–1908, and of same at Princeton, 1908. Member American Society of Zoologists, American Society of Naturalists, Fellow of American Association for the Advancement of Science, member National Academy of Sciences, American Academy of Arts and Sciences, foreign member K. K. Böhmische Akademie der Wissenschaften, vice-president Academy of Natural Sciences of Philadelphia, secretary of American Philosophical Society (1900–08), past president American Morphological Society, American Society of Naturalists, Section F (Zoology) American Association for the Advancement of Science, associate editor of *Biological Bulletin, Journal of Morphology, Journal of Experimental Zoology, Proceedings National Academy of Sciences, Genetics;* author of about 100 scientific papers among which the following are the most important: 'Fertilization of the Ovum'; 'The Embryology of Crepidula'; 'The Phenomena and Mechanism of Inheritance'; 'Factors of Evolution'; 'The Organization and Cell-Lineage of the Ascidian Egg'; 'Experimental studies on Nuclear and Cell Division,' 'Cell Size and Body Size'; 'Heredity and Environment,' etc.

CONKLIN, Jennie Maria (Drinkwater), American author: b. Portland, Me., 14 April 1841; d. New Vernon, N. J., 28 April 1900. She was educated in the public schools, and while still in her teens won fame with her stories for children. In 1880 she married Rev. Nathaniel Conklin. Her works include 'Miss Prudence'; 'Tessa Wadsworth's Discipline'; and 'Fifteen.' She originated the «Shut-In Society,» an organization of invalids for correspondence.

CONKLING, Roscoe, American legislator: b. Albany, N. Y., 30 Oct. 1829; d. New York, 18 April 1888. He removed to Utica in 1846, studied law and was admitted to the bar in 1850. He was mayor of Utica in 1858, and sat in Congress as a Republican (1858–62 and 1865–67). During the Civil War he was an active supporter of the administration, appearing constantly in debates and on committees. He was elected to the United States Senate in 1867, 1873 and 1879, and as senator he supported the reconstruction policy, actively opposed President Johnson and was a staunch supporter of President Grant. He was active in almost every move of importance made by his party. He was one of the foremost advocates of the Second Civil Rights Act, in 1875; of the bill creating the Electoral Commission to settle the disputed election of 1876; and of the act calling for the resumption of specie payment (1875). He became an extremely influential member of his party; in 1876 receiving 93 votes for the presidential nomination, and in 1880, by his support of Grant and his personal opposition to Blaine, dividing the Republicans into two sections. In May 1881, he and his colleague, Thomas C. Platt, suddenly resigned from the Senate, owing to a dispute with President Garfield on a question of patronage, and sought re-election; but after a warm canvass, both were rejected, though vigorously supported by Vice-President Arthur. Conkling afterward practised law in New York. He was appointed associate chief justice of the United States Supreme Court in 1882, but declined the position. Conkling was a thorough believer in the system of political patronage and he and Platt attempted to say where this patronage should go and to whom in the State of New York.

CONN, Herbert William, American biologist: b. Fitchburg, Mass., 10 Jan. 1859; d. Middletown, Conn., 18 April 1917. He was educated at Boston University and was professor of biology at Wesleyan University, Middletown, Conn. He published 'Evolution of To-day' (1886); 'The Living World' (1891); 'The Story of Germ Life' (1897); 'The Story of the Living Machine' (1890); 'The Method of Evolution' (1900); 'Agricultural Bacteriology' (1902); 'An Elementary Physiology and Hygiene for Use in Schools' (1903); and also over 150 scientific memoirs.

CONN, Lough, lŏh kŏn, a lake in the north of Mayo County, Ireland, united with Lough Cullin by a narrow channel. The two extend for about 13 miles and are studded with islands.

CONNATE WATER. See Ground Water.

CONNAUGHT, kŏn'-nât, **AND STRATHEARN,** Duke of, **Arthur William Patrick Albert,** English prince, sixth child and third son of Queen Victoria: b. Buckingham palace, 1 May 1850. He entered the Military Academy at Woolwich as a cadet in 1866; lieutenant, Royal Engineers, 1868; Royal Artillery 1869; captain, Rifle Brigade, 1871. On attaining his majority in 1871, Parliament voted him a grant of $75,000 a year, and an addition of $50,000 was voted on his marriage in 1879 to Princess Louise Margaret of Prussia. She died in London 14 March 1917 at the age of 57. Three children were born of the union, Princess Margaret (Crown Princess of Sweden), Prince Arthur and the popular Princess Patricia, in whose honor a Canadian regiment mobilized for the war was named «Princess Pat's Own.» The Duke of Connaught led an active life of 50 years' public service. In 1870 he served in Canada, was assistant adjutant-general at Gibraltar till 1876, when he was appointed personal aide-de-camp to Queen Victoria. He commanded the Guards' Brigade in the Egyptian campaign of 1882, and in 1886 was sent to India to assume command of the Bombay army. He returned home in 1890, commanded at Portsmouth for three years, and then succeeded Sir Evelyn Wood as commander-in-chief at Aldershot. From 1900 to 1904 he commanded the forces in Ireland and was created field-marshal in 1902. In 1901 the Duke was elected Grand Master of Freemasons in England in succession to his brother, the late King Edward. On the reorganization of the War Office in 1904, he became the first inspector-general of the forces and president of the selection board. In 1908 he was appointed to the newly-created post of commander-in-chief and high commissioner in the Mediterranean. In 1910 the Duke opened the first Parliament under the Union of South Africa, in Cape Town, and in 1911 became governor-general of Canada for five years. Since his return to England in October 1916 he has taken an active part in national organization. With the sole exception of King George, no member of any English royal family has seen more of the world and especially of the British Empire, than the Duke of Connaught.

CONNAUGHT, Ireland, one of the four provinces, bounded east and northeast by Leinster and Ulster, south by Munster, and north and west by the Atlantic; length, north to south, 112 miles; breadth, 99 miles; area, 6,867 square miles. It is the smallest, most westerly and least populous of the provinces. Its west coast is much broken up by numerous bays and inlets, and is thickly studded with islands. The surface is rugged and mountainous, except in the central part, which is comparatively level. It is, on the whole, the least fertile of all the provinces. Agriculture and fishing are the chief industries. Sheep raising is largely engaged in. Connaught was formerly one of the Irish kingdoms. Its kings were of the race of O'Connor, but they were almost exterminated at Athenry in 1305. In 1590 the English divided it into six counties — Galway, Leitrim, Mayo, Roscommon, Sligo and Clare — one of which, county Clare, was afterward transferred to Munster. Pop. 610,984, 96 per cent being Roman Catholics.

CONNEAUT, Ohio, town of Ashtabula County, situated at the mouth of Conneaut Creek, on the Lake Shore and Michigan Southern, the New York, Chicago and Saint Louis and the Bessemer and Lake Erie railroads. It has a good harbor at the mouth of the creek, where there is a lighthouse. It is an important ore and coal port, being noted for its exceptional facilities for handling large cargoes. There are extensive railroad shops and manufactories of canned goods, self-sealing packages, bricks, shovels, leather, lumber, etc. Conneaut also exports molding sand and farm produce. The city contains three hospitals, a Carnegie library and a public park. The electric-light plant is owned and operated by the city, which was first incorporated in 1832. It is governed by a mayor, elected biennially, assisted by council.

CONNECTICUT, kŏn-nĕt'-ĭ-kŭt, «the Nutmeg State,» «the Land of Steady Habits,» or «the Constitutional State» (having framed the first written constitution in America), is the southwesternmost of the six New England States. It is bounded by Massachusetts on the north, Long Island Sound on the south, Rhode Island on the east and New York on the west. Capital, Hartford. Area, 4,845 square miles land, 145 square miles water. Pop. 1,244,479.

History.— There is no doubt that the claim of the Dutch to Connecticut by right of discovery was well founded, for the accounts of the voyages of Henry Hudson in 1609 and of Adrian Bloch in 1614 give the first descriptions which history records of this region. The attempts of the Dutch to maintain their foothold by this right were few and ineffectual, failing to prevent William Holmes of Plymouth colony from establishing a trading post at or near Hartford in 1633.

Settlement.— The first permanent settlement by the English was made in 1636, though a disastrous attempt had been made in the previous year by a party from Massachusetts to occupy the three original towns. In June 1636 Rev. Thomas Hooker and Rev. Samuel Stone, with about 100 men, women and children, made their way from Massachusetts to the Connecticut Val-

CONNECTICUT

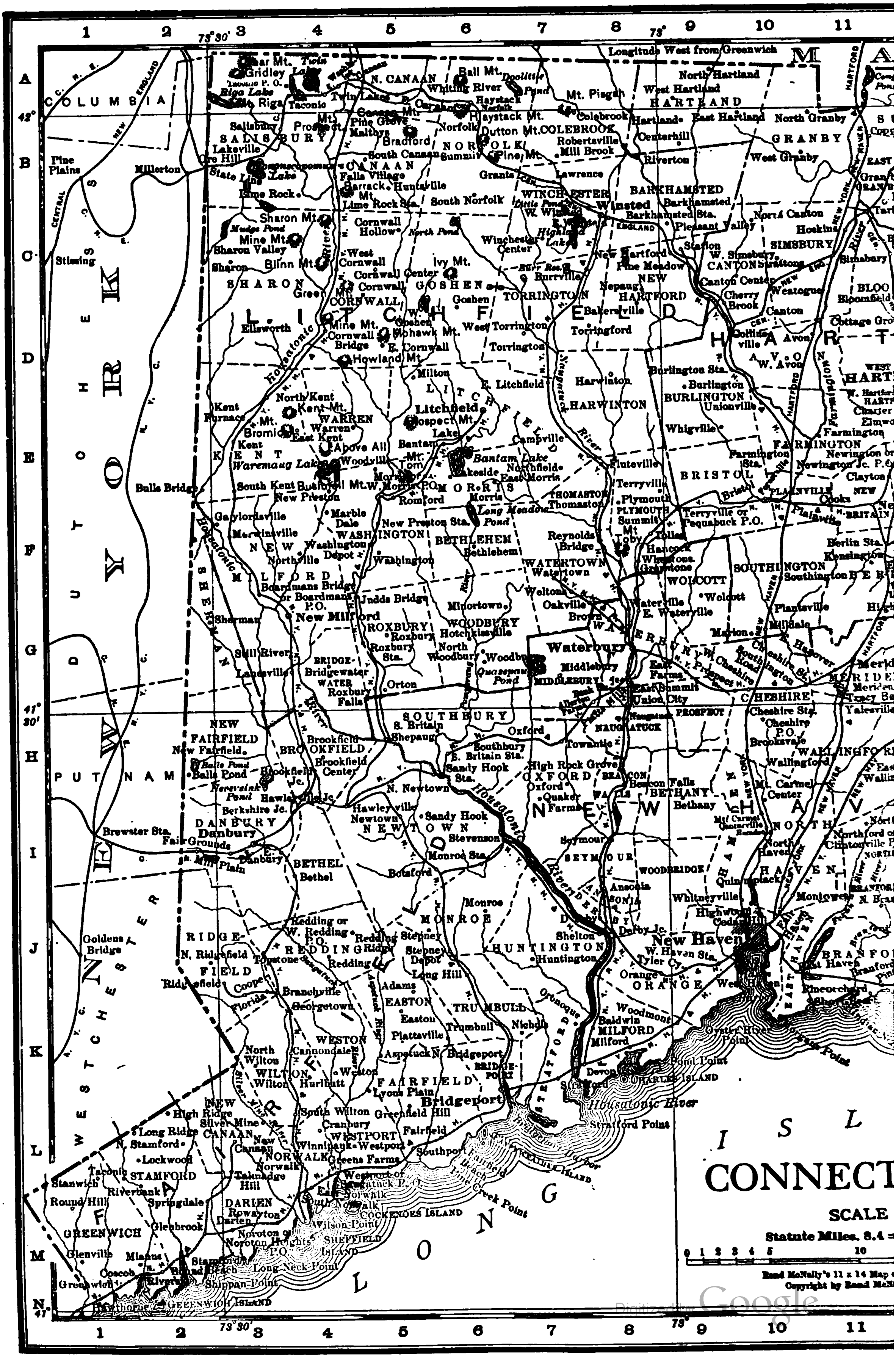
Estimated population, 1,244,479

COUNTIES

Pop.		
245,322	Fairfield	K 5
250,182	Hartford	D 12
70,260	Litchfield	D 6
45,637	Middlesex	H 14
337,282	New Haven	I 10
91,253	New London	G 19
26,459	Tolland	C 17
48,361	Windham	C 21

Incorporated Cities and Boroughs

16,704	Ansonia	I 8
3,041	Bethel	I 4
2,560	Branford	J 11
121,579	Bridgeport	K 6
15,927	Bristol	E 10
978	Colchester	G 17
22,556	Danbury	I 3
2,934	Danielson	D 22
9,655	Derby	J 7
897	Farmington	E 11
34	Fenwick	K 17
19,159	Greenwich	M 1
1,895	Groton	I 20
1,608	Guilford	J 13
110,900	Hartford	D 11
3,023	Jewett City	F 21
903	Litchfield	E 6
29,130	Meriden	G 11
13,273	Middletown	G 12
14,093	Naugatuck	H 8
53,794	New Britain	F 12
1,672	New Canaan	L 3
149,685	New Haven	J 9
20,985	New London	I 19
434	Newtown	I 5
26,899	Norwalk	L 3
21,274	Norwich	G 19
13,960	Orange	J 8
6,637	Putnam	B 22
1,114	Ridgefield	J 2
7,977	Rockville	C 15
4,807	Shelton	J 7
3,714	Southington	G 10
	South Norwalk (Pop. incl. in Norwalk)	M 4
3,059	Stafford Springs	B 16
30,884	Stamford	M 2
9,539	Stonington	J 22
18,018	Torrington	D 7
9,917	Wallingford	H 10
86,973	Waterbury	G 7
12,670	Willimantic	E 19
7,754	Winsted	C 8
194	Woodmont	K 8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FAIRFIELD
SALISBURY
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NORTH CANAAN
NORFOLK
COLEBROOK
HARTLAND
BARKHAMSTED
GRANBY
SIMSBURY
CANTON
SHARON
CORNWALL
GOSHEN
TORRINGTON
WINCHESTER
NEW HARTFORD
BURLINGTON
AVON
HARWINTON
KENT
WARREN
MORRIS
THOMASTON
PLYMOUTH
BRISTOL
FARMINGTON
NEW MILFORD
WASHINGTON
BETHLEHEM
WATERTOWN
WOLCOTT
SOUTHINGTON
ROXBURY
WOODBURY
WATERBURY
MIDDLEBURY
PROSPECT
CHESHIRE
SHERMAN
BRIDGEWATER
SOUTHBURY
NAUGATUCK
BEACON FALLS
BETHANY
NEW FAIRFIELD
BROOKFIELD
NEWTOWN
OXFORD
SEYMOUR
WOODBRIDGE
HAMDEN
NORTH HAVEN
WALLINGFORD
DANBURY
BETHEL
MONROE
HUNTINGTON
DERBY
ANSONIA
ORANGE
EAST HAVEN
BRANFORD
RIDGEFIELD
REDDING
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TRUMBULL
STRATFORD
MILFORD
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FAIRFIELD
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NEW CANAAN
WESTPORT
NORWALK
DARIEN
STAMFORD
GREENWICH
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Naugatuck River
Farmington River
Twin Lakes
Riga Lake
Bantam Lake
Waramaug Lake
Highland Lake
Long Meadow Pond
Quassapaug Pond
Balls Pond
Bear Mt.
Gridley
Mt. Riga
Taconic
Salisbury
Lakeville
Ore Hill
State Line
Lime Rock
Sharon Mt.
Mudge Pond
Mine Mt.
Sharon Valley
Sharon
Falls Village
Norfolk
Haystack Mt.
Winsted
Torrington
Litchfield
Bantam
New Preston
Washington Depot
New Milford
Waterbury
Thomaston
Terryville
Bristol
Plainville
Southington
Cheshire
Meriden
Wallingford
Naugatuck
Seymour
Ansonia
Shelton
Derby
New Haven
West Haven
Newtown
Sandy Hook
Danbury
Bethel
Ridgefield
Georgetown
Westport
Norwalk
South Norwalk
Darien
Noroton
Stamford
Glenbrook
Springdale
Greenwich
Cos Cob
Riverside
Mianus
Round Hill
Stanwich
Bridgeport
Fairfield
Southport
Stratford
Milford
Devon
Woodmont
Millerton
Pine Plains
Stissing
Balls Bridge
Brewster Sta.
Goldens Bridge
Charles Island
Stratford Point
Long Neck Point
Cockenoes Island
Sheffield Island
Greenwich Island
Shippan Point
Wilson Point
Long Beach
Oyster River Point
LONG ISLAND
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Rand McNally's 11 x 14 Map
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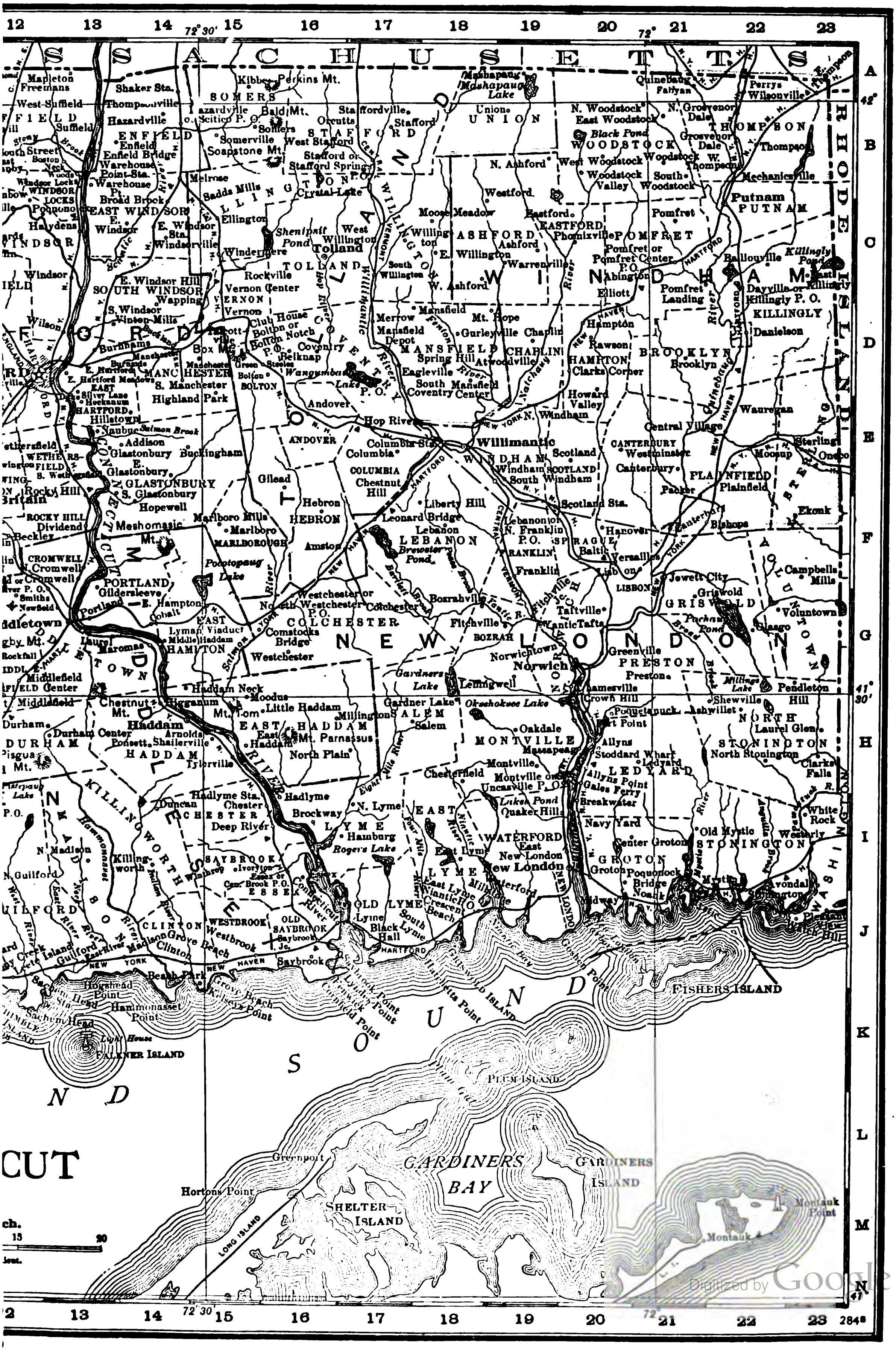
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WINDHAM
NEW LONDON
MIDDLETOWN
MIDDLESEX
CONNECTICUT RIVER
SOUND
CUT
SOMERS
STAFFORD
UNION
WOODSTOCK
THOMPSON
ENFIELD
ELLINGTON
WILLINGTON
ASHFORD
EASTFORD
POMFRET
PUTNAM
KILLINGLY
TOLLAND
VERNON
SOUTH WINDSOR
EAST WINDSOR
MANCHESTER
BOLTON
COVENTRY
MANSFIELD
CHAPLIN
HAMPTON
BROOKLYN
ANDOVER
COLUMBIA
WINDHAM
SCOTLAND
CANTERBURY
PLAINFIELD
STERLING
GLASTONBURY
HEBRON
LEBANON
FRANKLIN
SPRAGUE
LISBON
GRISWOLD
VOLUNTOWN
MARLBOROUGH
PORTLAND
EAST HAMPTON
COLCHESTER
BOZRAH
PRESTON
EAST HADDAM
SALEM
MONTVILLE
LEDYARD
NORTH STONINGTON
HADDAM
DURHAM
KILLINGWORTH
CHESTER
LYME
EAST LYME
WATERFORD
GROTON
STONINGTON
SAYBROOK
ESSEX
OLD LYME
OLD SAYBROOK
WESTBROOK
CLINTON
MADISON
GUILFORD
Hartford
Willimantic
Norwich
New London
Middletown
Rockville
Tolland
Putnam
Danielson
Stafford Springs
Windsor Locks
Manchester
Glastonbury
Colchester
Haddam
Mystic
Westerly
Stonington
Mashapaug Lake
Wangumbaug Lake
Pocotopaug Lake
Gardners Lake
Oxoboxo Lake
Rogers Lake
Pachaug Pond
Killingly Pond
Shenipsit Pond
FISHERS ISLAND
PLUM ISLAND
GARDINERS ISLAND
GARDINERS BAY
SHELTER ISLAND
FALKNER ISLAND
Montauk Point
Montauk
Greenport
Hortons Point
Hammonasset Point
Sachem Head
Long Island
2846

ley, and there re-established the almost abandoned settlements at the three towns which bore the transplanted Massachusetts names of Newtown, Watertown and Dorchester, but were, in the following year, respectively named Hartford, Wethersfield and Windsor. Within a year from the time of this settlement about 30 of the settlers had been wantonly killed by the Pequot Indians, who appeared to be plotting the extermination of the English. In May 1637 Maj. John Mason, with a band of 90 men, was dispatched to attack the Pequots at their stronghold in the present town of Groton. Reaching, by strategic movements, the stockade, where a large number of them were encamped, he took them completely by surprise, killing about 700 by setting fire to their inflammable wigwams and putting to death in hand-to-hand conflict those who escaped the flames. This resulted in the extermination of the Pequot tribe, and secured to the settlers exemption from Indian depredations for all time to come.

The colonists now began to prosper under the leadership of the pastors, Hooker and Stone. Finding themselves outside of the jurisdiction of Massachusetts, to which they at first supposed that they were answerable, they proceeded to form a civil government of their own, adopting in 1639 the Constitution which stands unique in history as the first written constitution of a self-governing people. Its principles had been preached from the pulpit by Thomas Hooker, and its spirit, if not its form, prevailed in the Federal Constitution which was adopted through the influence of Oliver Ellsworth, Roger Sherman and William Samuel Johnson of Connecticut just 150 years later. By this Constitution of 1639 much less rigid ecclesiastical control prevailed than in Massachusetts Bay and Plymouth colonies, the people were recognized as sovereign, and the authority and even the existence of the ruler of Great Britain was ignored. Meantime there had sprung up in Quinnipiack a budding colony, afterward known as New Haven colony, under the leadership of Theophilus Eaton and the Rev. John Davenport. This colony in 1639 adopted resolutions which vested the government in seven pillars of the Church, and disfranchised all who were not church members. In 1662 John Winthrop, the younger, then governor of Connecticut, obtained in England from Charles II a charter which established Connecticut as an independent colony under the constitution already adopted, and defined the boundaries to include New Haven colony, which was thus absorbed, though sorely against its will.

Charter Rights.— From this time onward, for 50 years, Connecticut was engaged in a constant struggle to maintain the rights which the charter had granted. Conflicting grants by Charles II to his brother, then Duke of York; boundary disputes; conflicts of authority with other colonial governors; and the fear that the charter might be annulled by royal decree, kept the statesmen of the day in an attitude of continual vigilance, and schooled them in diplomacy, tact and political alertness. But once in her history, and then only for a year and a half, did Connecticut lose that autonomy which she cherished as her birthright. This was during the usurpation of Andros, in 1687. But the charter was preserved, though Andros demanded it. Its preservation was the result of one of the Yankee tricks for which Connecticut has always been famous, and which may have had something to do with giving her the equivocal title of «the Nutmeg State.» The charter was brought into the general court toward nightfall at Andros' request. Candles were lighted and, by some mysterious agency, suddenly extinguished. During the darkness which prevailed the charter disappeared. Andros assumed the government, and Secretary John Allyn wrote «FINIS» at the close of the record of the proceedings. In May 1689 came the downfall of Andros, and the government and charter reappeared, with the astute Governor Treat once more in the chair, and an undying reverence established for the old charter oak, where, as tradition tells us, Capt. Joseph Wadsworth hid the precious document when it so suddenly disappeared.

War Services.— From the resumption of the government under the charter to the close of the French war in 1763, Connecticut saw much military service, for which she furnished her full quota, on other soils than her own. The short intervals of peace during this long period did not suffice to regain prosperity, and the year 1763 found the colony impoverished by contributions of men and money in the French and Spanish wars, and confronted with the odious news of the Stamp Act. The enforcement of this measure was prevented by compelling the stamp-master to sign a paper stating that he resigned «of his own free will.»

In the War of the Revolution which followed, the share of Connecticut forms a most important feature, still hardly appreciated by historians. The colony was amply, though quietly, prepared in every way for the coming struggle in 1775. Perfect unanimity prevailed. It was unnecessary either to reconstruct the government, as was done in Massachusetts, or to depose the governor, as was done in all the other colonies. Connecticut alone of all the 13 colonies had from the beginning a governor, Jonathan Trumbull, who was an ardent believer in the cause of his country. He became a trusted adviser and helper to Washington. A cherished Connecticut tradition asserts that the national nickname, «Brother Jonathan,» is derived from the fact that Washington had used this sobriquet in speaking of Governor Trumbull. From recent compilations of muster-rolls it is safe to assert that Connecticut furnished 40,000 men in her various enlistments in this war. In the adoption of the Declaration of Independence she was the first colony to instruct her delegates to vote for this measure. During the war, she gained the title of «the Provision State,» owing to the unstinted supplies which she sent to the front in all times of need, relieving, for example, the sufferings of the starving soldiers at Valley Forge by sending forward droves of live cattle when Washington wrote Trumbull that the army must disband unless supplies were forthcoming.

As in the French, Spanish and Indian wars, so in the Revolution, Connecticut's position was, in a certain sense, altruistic, for but little fighting was done on her soil, and it was done at times when her own fighting men were serving their country beyond their own immediate borders. The ravages of two of the most savage massacres and two of the most barbarous raids of the war brought their horror and devastation to this little commonwealth. The Wyoming massacre was an attack on Connecticut settlers on disputed Connecticut soil, justly claimed under grants of the charter, which extended the western boundaries to the «South Sea» or Pacific Ocean, whose location was majestically ignored by Charles II and his advisers. Wyoming or Westmoreland, now in Pennsylvania, was at the time of the horrible massacre of July 1778 a county of Connecticut, having been previously a part of Litchfield County, and having been for 25 years settled by a Connecticut company after repeated repulses which only served to strengthen resistance and establish an apparently permanent foothold on the part of the settlers. The refugees, of whom women and children composed a large majority, fled to their homes in Connecticut after the massacre, the terrible results of which did not prevent many of the former inhabitants from returning to Wyoming, and once more establishing themselves in that beautiful region from which they had been so often ruthlessly driven. The other massacre, at Groton, occurred toward the close of the war, 6 Sept. 1781. The raid was commanded by Benedict Arnold, to whom it is unfair to attribute the most disgraceful part of it. He was in New London at the time of the occurrence, his troops having burned a large portion of the town. The little garrison of Fort Griswold at Groton made a brave resistance against forces outnumbering them six to one. When, at last, the British entered the fort, Ledyard, the American commander, presented his sword to the officer in command of the British in token of surrender. This brute, whose name, fortunately for his memory, has never been discovered, received the sword and plunged it at once through Ledyard's heart. This was a signal for indiscriminate slaughter, in which hardly a man of this surrendered force was left unhurt, and but few left alive.

The raids of Gov. William Tryon on Danbury in April 1777, and on New Haven, Fairfield and Norwalk, in July 1779, resulted in great destruction of property by fire and plunder, and in the loss of many lives on both sides. It may be truly said that never but twice did these invaders remain on Connecticut soil over night, and in each case took to their ships the next morning with Connecticut troops in hot pursuit.

Notwithstanding the terrible drain which the Revolution made upon her resources, Connecticut, through her wise financial policy, was better prepared, at the close of the war, to avail of the advantages of peace than were any of the other States with the exception of Delaware. It is hardly surprising that the War of 1812 should have been unpopular in Connecticut as well as in all New England; but too much opprobrium has been heaped on Connecticut by giving the protesting convention for all New England the name of the Hartford Convention for the simple reason that it was held, for convenience, in Hartford. It will be found that Connecticut furnished for this war, too, a goodly number of men, though there were some disputes as to the manner and form of doing it. For the half century following this war, peace and prosperity prevailed, broken only by the comparatively insignificant, but sufficient, contribution which was made to the Mexican War.

The outbreak of the Civil War in 1861, like the outbreak of the Revolution in 1775, found Connecticut with a governor in office who was equal to the emergency. Gov. William A. Buckingham, upon his own responsibility, called for a regiment of volunteers, 16 April 1861, when there was not a regiment of organized militia in the State to meet Lincoln's first call. The private citizens and the towns voted money to forward troops; and soon, instead of one, three regiments of volunteers reported for service, making it necessary for the governor to go to Washington to have three times the quota accepted under the call. At the close of the war, the official record shows that Connecticut had furnished 54,882 volunteers, which number was largely in excess of her quota.

Industries.— This war stimulated the industries of Connecticut, which had, at the time, reached a high stage of development. The demand which the large and suddenly equipped army and navy of the country made upon these industries could not fail to have this effect. During the years which have followed the War, the development of manufactures has continued to keep up a healthy growth. This little commonwealth, originally composed of intelligent farming communities, has, by a perfectly natural process of evolution, developed into a manufacturing State which, small though it is in area, holds the rank of eleventh in the gross value of its manufactured products, and the rank of second in the per capita value of these products among the 52 States and Territories enumerated in the latest census. Still more significant is the fact that a larger number of patents in proportion to the population have been issued to Connecticut inventors than to those of any other State in the Union during the past 10 years.

It appears to be a fact that in early colonial times the same inventive genius which has developed in this little commonwealth was born of necessity, and that it was transmitted by heredity down to the present day. The first settlers brought with them intelligence, broadened views of ecclesiastical control and little or nothing more. There were no industrial specialists among them; and a century after the towns of the colony had taken root in various parts of the soil the leading townsmen, besides being still farmers with a growing tendency to trade, were each of them equal to any industrial or political emergency which might arise. Diaries covering the first half of the 18th century show, for example, that the diarist was a ship-carpenter, house-carpenter, millwright, surveyor, judge of probate, soldier and deputy to the general assembly, while pursuing the regular occupation of a trading farmer; and that his neighbors were equally versatile in their industrial and political pursuits. This diversity of individual talents naturally grew, in time, to specializing, as the resources and needs of the commonwealth developed. In 1705 the Granby copper mines were discovered, and unprofitably worked, leaving as souvenirs the Granby copper coins, and the old mine itself, which was used as a prison during the Revolution, and abandoned at the time of establishing the State prison at Wethersfield in 1827. Other attempts at mining for precious metals were equally unsuccessful, but the working of the Salisbury iron mines, which have been in operation since 1730, proved to be a lasting success. From these mines cannon balls, camp-kettles and other useful articles were furnished during the Revolution, including the chains which were used to bar the progress of the British fleet on the Hudson. The anchor of the famous ship *Constitution* was forged from Salisbury iron in later days. The ore is a rich hematite, which, prepared by the use of charcoal, yields pig-iron which rivals the famous product of the Swedish and Norwegian mines.

Manufactures.— As early as 1749 we find that John Allyn had experimented in brass-making; and in 1768 the first paper-mill of Connecticut, if not the first in the country, was successfully established by Christopher Leffingwell of Norwich. Tinware was first made in Berlin in 1770, and furnished for a century or more an important industry in which the Yankee peddler exercised his wit and shrewdness. In 1773 Thomas Harland from London established at Norwich a shop for making and repairing watches and clocks. In this shop Eli Terry learned the mechanism of the timepieces of the day, and afterward applied his inventive genius to the manufacture of pillar-scroll and case clocks, which he perfected in 1793. Other Connecticut inventors, especially Seth Thomas and Chauncey Jerome, have brought clock-making to, or very near, its present advanced stage. Eli Whitney, the inventor of the cotton-gin, though not a Connecticut man by birth, owed his fortune to the successful manufacture of firearms at New Haven in 1798, after having been robbed of his great invention in the South in 1792.

The first manufacture of sewing-machines on an extended scale was established by Elias Howe, at Bridgeport, followed in the same city by the improvements of Wheeler and Wilson. In 1844 Charles Goodyear of New Haven obtained his first patent for the process of vulcanizing india-rubber, a process entirely of his own discovery, which revolutionized this important industry in his day, or rather made a new and still enormously increasing industry in the use of material which, without this invention, would have continued to occupy an unimportant place in the industries of the world. The invention of electro-silver plating is traced to the Rogers Brothers of Hartford. In 1846 these three brothers, Asa H., William and Simeon S., succeeded, after much experimenting, in finding a successful way of applying this process to articles made of various metals. From small beginnings, the business grew to large proportions, resulting in great establishments in Hartford, Meriden, Waterbury, Norwich and elsewhere.

The manufacture of textile fabrics had its beginnings in a small woolen factory in Hartford in 1788, and a small cotton mill in Vernon in 1804, but the growth of this industry to its present proportions did not begin in any marked degree till after the enactment of the Joint Stock Act, in 1837, allowing small sums to be capitalized and small proprietors to join their forces in manufacturing. This act, forming a long step in the evolution of the modern trust, since it was copied by nearly every State in the Union, and by Great Britain, thus changing the business of the world, was the work of a Connecticut man, Theodore Hinsdale.

Many cotton mills are on the Shetauket, Yantic and Quinnebaug rivers. The Ponemah Company, at Taftville, has a mill, which, when it was built, was the largest cotton mill in the world. The Willimantic Linen Company is one of the greatest thread producers in New England. More than seven-tenths of the cotton spindles of the State are operated at Norwich, Thompson, Plainfield, Killingly and Willimantic. The woolen mills are more widely distributed throughout the State, at Vernon, Stafford, Broad Brook, New Britain, Norwich and elsewhere. Among the textile manufactures that of silk is important, having had its small beginnings so early as 1732 and now placing the State third in the Union in that industry. In 1914 the silk products were valued at $30,592,000. The works of the Cheney Brothers, at South Manchester, established in 1838, are among the largest in the country.

The manufacture of textiles, including silk, wool, worsted, cotton, felt, hosiery and knit goods, forms one of the leading manufacturing industries of the State. Recently manufactures gave employment to 226,264 wage-earners, receiving wages amounting to $126,210,000, with capital invested amounting to $620,194,000, and manufactured products valued at $545,240,000. Waterbury is prominent in making brass; Meriden in silver and plated ware; New Britain (which has the largest proportion of wage-earners, 34.2 per cent, and the greatest number of nationalities represented in its population) in hardware, cutlery and knit goods; New Haven and Bridgeport in firearms, corsets and rubber goods; Hartford in hardware and firearms. The variety of manufactured articles is noticeable, from blotting-paper to aircraft. Connecticut was the leading State in the value of firearms and munitions manufactured in 1910, two-fifths of the total for the United States having been reported; and that amount has been vastly increased since 1914 by the output of Winchester's, Marlin's and Maxim's in New Haven, of the Union Metallic Company and American-British Company in Bridgeport, of Colt's in Hartford, besides other firms in Meriden, Norwich and elsewhere. The prodigious activity of these establishments has added many thousands to the population of those cities. Connecticut ranks first in brass and bronze products, in clocks and watches, corsets and plated ware, producing two-thirds of the total amount of the last in the United States; is second in cutlery and rubber boots and shoes, the Candee Rubber Company in New Haven turning out 25,000 pairs of rubber shoes every day. The automobile and aircraft manufactures show great increase since 1900.

Agriculture.— Although the history of agriculture in Connecticut presents a contrast to that of manufacturing by showing a decline in proportion to the population, agriculture is still second in importance among industries. It must be remembered that the little commonwealth is the smallest but two of the States and Territories. Its area may be rather indefinitely divided into the central lowland, the coast, the eastern and western uplands. Of these, the central lowland, lying in the valley of the Connecticut River, is from Middletown to the northern boundary best adapted to cultivation; and here it was that, after spying out the land, the first colonists, whose sole industry was agriculture settled.

From Middletown to the coast, the river leaves the lowland and cuts a narrow valley through the eastern upland. The portion of the central lowland between Middletown and New Haven is less fertile. The eastern upland varies in fertility, but contains some rich farming land. It has also the advantage of a lower average elevation than the western upland, where the only mountains of the State are found. One of these, Bear Mountain, reaches an elevation of 2,000 feet or more.

Hay and fodder rank first in value, as crops; tobacco, second; market gardening, poultry raising and dairy farms stand high as profitable employments. The large proportion of consumers, and, especially, the facility of marketing, generally, without middlemen, and often without even railroading, cause the profit from crops to be larger in Connecticut than in States more strictly agricultural. The whole output can be sold easily within the limits of the State; and the cities of New York and Boston offer good markets. Connecticut brings in $198.34 per acre for small fruits, more than any State except Florida; her apples bring in a return in bushels per tree surpassed by New York and Colorado only, and in value, by Massachusetts, New York, Colorado and Arizona only; and she raises more corn per acre than any other State, with an average yield annually of 53.2 and 48.5 bushels per acre. An acre of vegetables in Connecticut brings more money than in any other State except Massachusetts and New Hampshire. Peach raising is important, with large crops and corresponding profits. Wallingford and Glastonbury leading the State in that industry. The cultivation of tobacco began in the Connecticut Valley, near Hartford, as early as 1680. Improved methods of curing the harvested plant have added much to its value in late years, the tobacco being of the best quality for wrappers. Three types are raised, the Havana seed-leaf, principally on the west bank of the Connecticut River, the broad leaf, on the east side, and the shade grown, mostly on the west side, the last having steadily increased in acreage, the advantage derived being still disputed. In all, 29,970,000 pounds were raised in 1915, valued at $5,095,000. Tobacco is worth more per acre as a crop than in any other State. In the other New England States, the number of dairy cattle has decreased since 1905, but Connecticut has maintained her dairy industry unimpaired. The raising of cattle for food has decreased. In 1915 the average value per acre of farm land for the whole State was $33.03; in the southwestern part, it was from $75 to $100 per acre. This average value of farm land increased 21.14 per cent between 1900 and 1910, or over one and three-fourths times as much as during the preceding half century. From 1912 to 1915, there was a gain in value per acre of farm land of $7 for improved and $5 for unimproved.

The shell-fish grounds belonging to the State are an important source of revenue; and are protected by strict regulations under the careful watch of the Shell-Fish Commissioners, who keep the grounds guarded by patrol boats in all but very inclement weather.

Railroad and Other Companies.—The railroads are the New York, New Haven and Hartford, with 851 miles operated in the State and a total mileage of 2,004.58; New London and Northern, with 56.10 miles in the State, total mileage, 58.60 (operated by the Central Vermont); Central New England, with 83.08 miles in the State, total mileage, 522.80; Central Vermont, with 58.60 miles in the State, total mileage, 572.60; Hartford and Connecticut Western, leased by Central New England, with 77.26 miles in the State, total mileage, 123.96; Norwich and Worcester, with 53.16 miles in the State, total mileage, 71.07 (operated by New York, New Haven and Hartford); South Manchester, total mileage, 3.15; Branford (freight only), total mileage, 4.20. The total mileage in the State is 999.58, and the total miles operated by companies in the State, 5,638.01 (all tracks). Since the government has taken over the railroads, it is difficult to give figures for receipts, expenses, and profits, which in fact may vary from month to month.

The Public Utilities Commission reported, in 1915, 25 electric companies, 2 express companies, 12 gas companies, 15 gas and electric companies, 8 railroad companies, 22 street railway companies, 3 telegraph companies, 10 telephone companies and 87 water companies, most of these companies showing an increase of business.

Banking and Finance.— In the banking business of the State, the most important item is the deposits in the 82 savings banks, January 1915, making a total of $335,086,694.93, and an increase during 1914 of $25,448,326.74. The State ranks third in the number of its savings bank depositors, if mutual or trustees savings banks only are considered, those being the prevailing kind in New England and the East. Considering stock savings banks, which are found in the other parts of the United States, California is third and Connecticut fourth. In 1915, the number of depositors was 629,655. There were 73 national banks of deposit, with aggregate capital of $19,784,300, and surplus of $11,121,000; 58 State banks and trust companies, with capital of $8,098,200, and surplus of $4,168,388.29; 5 investment companies, with capital stock of $664,150; and 4 Morris Plan companies with gross resources of $421,125.30; and 20 building and loan associations.

The oldest bank of deposit in the State and the fifth in age in the United States is the Union Bank and Trust Company of New London, chartered in 1792, and still doing business under its old charter. Still earlier, in 1732, Thomas Seymour and others, of New London, secured a charter for banking purposes, but it was revoked within four years. The four oldest banks in the State, in Hartford, Middletown, New London and New Haven, are well on in their second century, and are still very prosperous. The Middlesex Banking Company, of Middletown, chartered in 1872, is the oldest mortgage company in the country.

Insurance.— The insurance business of the State centres in Hartford, where are 7 of the 8 stock fire insurance companies, which represented, in 1916, in all, capital of $15,750,000, and surplus of $25,618,617.38; 12 mutual fire insurance companies report, in all, a surplus of $2,447,520.61; and there are many other mutual companies. The 6 life insurance companies are all in Hartford, and reported, in 1916, aggregate assets of $343,203,670.66. There were also 6 indemnity companies and 6 miscellaneous insurance companies. Of the many fraternal benefit societies, 8 reported in 1910 assets amounting to $107,649,937.50.

Religion.— The ecclesiastical history of Connecticut would fill a large volume, and is an interesting study of the development of religion in this country. It is enough to say that, at the beginning, the colony stood unique as a compromise between the rigid ecclesiasticism of Massachusetts Bay and Plymouth colonies, and the religious liberty which Roger Williams was, at the time, establishing in Rhode Island. Unique though it was, it can be called a theocracy only at the beginning, for the State was then the Congregational Church, pure and simple, and though others than church members could vote, they were obliged by the early code to vote taxes for the support of the church. The process of emancipation from these theocratic conditions was slow, and did not reach perfection until the adoption of the new Constitution in 1818. Through this period of nearly two centuries there were executions for witchcraft at Stratford in 1651; at Fairfield in 1653; and possibly at Windsor in March 1646 or 1647, if the journal of John Winthrop is to be taken as an authority; and in the theological tenets which were adopted from time to time under direction of the general court and otherwise, we pass through a maze of solemn discussions of the Half-way Covenant, the Cambridge Platform, the Saybrook Platform, with the later New Lights and Old Lights arrayed against one another as Separatists and Conservatists. Legislation exempting the Church of England from taxation for support of the Congregational Church was had in 1727, and in 1729 was extended to cover cases of the Baptists and Quakers. In 1791, the right of incorporation was allowed, under certain restrictions, to all religious bodies. The first Baptist elder was ordained at New London in 1726, but the sect did not gain largely until the beginning of the 19th century. The Protestant Episcopal Church was not established under a regularly ordained bishop until after 1784, although it had made beginnings before that time, but was practically exterminated during the Revolution, owing to the Toryism of its clergy. In 1789, the first Methodist Episcopal church in the State was established at Stratford. The first Roman Catholic church in Connecticut was established in 1830, and in 1843 the diocese of Hartford, embracing the entire State, was established.

The statistics of religious denominations are but partially available, only a few of the denominations publishing complete reports. The Protestant denominations are divided into many sects. The number of ordained ministers is given as follows: Advent, 23; African M. E. Zion, 15; Baptist, 209; Catholic Apostolic, 5; Congregational, 497; English Lutheran, 17; German Lutheran, 19; Swedish Lutheran, 17; Hebrew, 8; Methodist Episcopal, 177; Presbyterian, 14; Episcopal, 194; Roman Catholic, 432; Unitarian, 5; Universalist, 10.

Charitable Institutions.— The educational institutions which are partly or wholly sectarian in character will be mentioned in speaking of the general subject of education. The Board of Charities reported, in 1914, as in successful operation, 26 hospitals, public and private; 6 sanatoria for tubercular patients; 2 State hospitals for the insane; 12 private asylums for the insane; 1 colony for epileptics; 1 school for imbeciles; 2 schools for the deaf; 1 school for the blind; 2 homes for old soldiers; 8 county temporary homes for children; 67 almshouses; 20 private homes for old people; 19 private homes and asylums for children; and recent additions to the list have been made. Of these, the Roman Catholic Church supports 3 orphan asylums, 5 hospitals, 2 homes for aged poor, and the Swedish Congregational Association largely supports one orphanage. Of the almshouses, 61 are owned by the towns or cities in which they are situated, and 6 are owned and managed by private individuals, 101 towns caring for their poor in their own houses or in families. The Hartford Retreat for the Insane, the third in age in the United States, having been opened in 1821, holds a unique position, because, although always a private institution, it was long the only place in which State patients could be received; and some such are still committed to it each year.

Penal and Reformatory Institutions.— There are 1 State prison; 10 county jails; 1 State reformatory for male delinquents between 16 and 25; 1 school for boys; 1 industrial school for girls; 3 homes for young women offenders, of which last the Roman Catholic Church supports one. The State Reformatory, opened in 1913, is doing a very satisfactory work, and is an important addition to the correctional work of the State. The total expense to the State for the care of delinquents, defectives and dependents in 1914 was $1,946,517.92.

Education.— The educational system of Connecticut was planted almost literally with the first corn that was planted by the early settlers. From the small beginnings in the few towns, the present system of public schools has been evolved, aided materially in 1795 by the proceeds of the Western Reserve Lands, now in the State of Ohio, which were sold in order to establish a school fund. The lands, to the extent of about 3,500,000 acres, were granted to Connecticut by the United States in 1786 as a tacit compensation for her loss of the Wyoming territory by a decree of 1782. About 500,000 acres were granted by Connecticut to those within her jurisdiction who had suffered from the incursions of the British during the Revolution, and the remaining 3,000,000 acres were sold for the establishment of a school fund. That fund remains intact to the present day, and amounted, in October 1916, to $2,008,590.79, yielding an income of $116,850.55 for that year, and providing 43 cents of the $2.25 per child, distributed to the schools on the basis of enumeration. Another fund, known as the town deposit fund, was Connecticut's share of the apportionment from the surplus of the United States Treasury in 1837, and was given by the State to the towns. Under the law of 1859, the entire income of this fund was to be used for education; but it has become so merged in the general treasuries of the towns that it scarcely has a separate existence. Beyond this State support, the common school system depends on taxation in various towns and school districts to meet expense. By a recent decision of the courts, a school district may, in lieu of the payment made by the State of $2.25 per year for each enumerated school child, receive from the town the actual expense of conducting the schools for 188 days in the year.

Education is compulsory, within the limits of 7 and 16 years. The control of the common school system is varied, being by committees, either of towns or of school districts, or by boards of education, the tendency being toward the consolidation of districts in each town. Supervisors have been introduced with good effect, and in increasing numbers. Trade schools, where vocational preparation is given by practical experts in the different trades, are assuming a prominent place in the scheme of public education, and are well equipped. In addition to the common schools, to whose support it contributes, the State now supports four normal training schools for teachers. It also supports and controls an agricultural college and an agricultural experiment station. In 1915 the public school buildings numbered 1,510, employing continuously 6,392 teachers, with many others employed at times. The average daily attendance during 1915 was 175,881. The value of school property was $23,193,194.84; the total expenditure for public schools as reported by towns was $9,590,562.67; the receipts on account of public schools, as reported by towns, was $7,656,423.37; received from loans, $1,949,796.13; indebtedness of towns on account of schools, $8,703,329.31. The expenditure per child registered in 1915 was $23.67; per child in average attendance, $36.87; the increase in cost per child in average attendance in the 10 years preceding 1916 averaged $1 a year.

In addition to the public schools, there are in the State 261 private schools, of which 82 are parochial schools of the Roman Catholic Church, 6 parochial schools of the Lutheran Church, and the rest are non-sectarian, being business colleges, boarding schools and secondary schools. These 261 private schools employ 1,726 teachers and are attended by 52,293 pupils. The higher institutions of learning are all supported by tuition and endowment, or church funds. The principal ones are Yale University, Wesleyan University, Trinity College, the Hartford Seminary Foundation, including Hartford Theological Seminary, School of Religious Pedagogy and Kennedy School of Missions, with other schools to be added; the Berkeley Divinity School, Saint Thomas Catholic Seminary, Saint Joseph Catholic Seminary, and the Connecticut College for Women at New London. Each of these, except the last, has a large library of its own, that of Yale University being the largest in the State with over a million volumes. The Yale Elizabethan Club owns the best collection of Tudor and Stuart drama to which the public has access in this country. The collections, mineralogical, geological and palæontological, of the Peabody Museum of Yale University are of great value, as are the collections of Greek and Etruscan vases, and of Babylonian antiquities, the Jarves gallery of early Italian paintings, the photographs collected by the Yale Peruvian Expeditions and the Steinert collection of musical instruments.

The State Library at Hartford contains a large and valuable collection of the laws and official documents of other States and the general government; besides which it has accumulated a general collection in which history is prominent; it also contains many rare and original documents, including the charter of 1662. In 1916 there were in the State 218 public libraries.

The principal historical societies are the Connecticut, the New Haven Colony, the New London County, the Middlesex County, the Mattatuck (of Waterbury), Historical societies, and the Bridgeport Scientific and Historical Society.

The growing desire for increasing the artistic sense of the community is shown by the organized efforts in New Haven, Bridgeport, Hartford and other places, for the purpose of developing beauty in their own domains.

Government.— The government of Connecticut has been conducted under two different constitutions, the first of which was adopted in January, 1638–39, and was fortified and protected by the charter of 1662; and the second, which was adopted as the result of a constitutional convention in 1818. This constitution, with its subsequent amendments, forms the organic law of Connecticut at present. Under it the governor, lieutenant-governor, secretary of state, treasurer, comptroller and members of the general assembly are chosen biennially by the people. Other State officers are appointed either by the governor, sometimes with, and sometimes without, the consent of the senate, or by the general assembly.

The General Assembly is composed of a senate consisting of 35 members, and a house of representatives, consisting of 258 members. One senator is elected from each of the senatorial districts; one representative each from 78 towns, and two each are elected from 90 towns. In 1911 the State was divided into 5 senatorial districts, instead of 4, for electing members of Congress. In 1914, 87 towns voted for no license and 90 for license, one being equally divided. The courts are the Supreme Court of Errors and the Superior Court, the judges serving for terms of eight years; the Court of Common Pleas, and the District Court, for four years, all of these judges being appointed by the general assembly on nomination by the governor. Judges of city, borough and town courts are appointed for terms of two years, by the general assembly. There are in the State 113 probate districts, the judges of which are elected by the people.

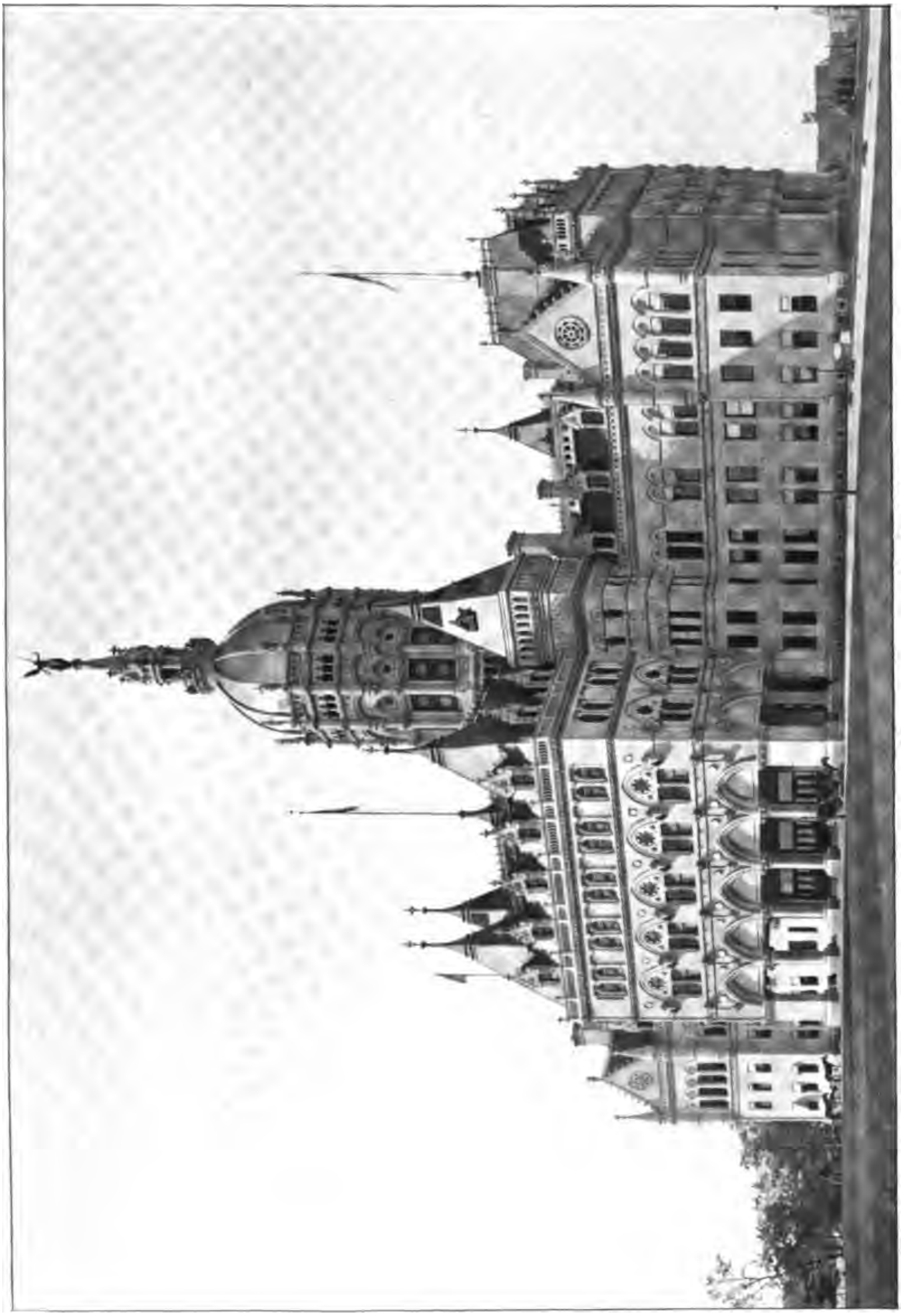
COLONIAL GOVERNORS

Connecticut Colony

John Haynes	1639–40	John Webster	1656–57
Edward Hopkins	1640–41	John Winthrop	1657–58
John Haynes	1641–42	Thomas Welles	1658–59
George Wyllys	1642–43	John Winthrop	1659–76
John Haynes	1643–44	William Leete	1676–83
Edward Hopkins	1644–45	Robert Treat	1683–87
John Haynes	1645–46	Edmund Andros	1687–89
Edward Hopkins	1646–47	Robert Treat	1689–98
John Haynes	1647–48	Fitz John Winthrop	1698–1707
Edward Hopkins	1648–49	Gurdon Saltonstall	1707–24
John Haynes	1649–50	Joseph Talcott	1724–41
Edward Hopkins	1650–51	Jonathan Law	1741–50
John Haynes	1651–52	Roger Wolcott	1750–54
Edward Hopkins	1652–53	Thomas Fitch	1754–66
John Haynes	1653–54	William Pitkin	1766–69
Edward Hopkins	1654–55	Jonathan Trumbull	1769–76
Thomas Welles	1655–56		

(Originally no one was to be chosen governor two years in succession; which accounts for the alternating terms of office. In 1660, this restriction was abolished by the free-

CONNECTICUT



Capitol, Hartford, Conn.

men. Until 1752, the legal year in England began 25 March, not 1 January. This, with the difference of 11 days between Old Style and New Style, accounts for many apparent discrepancies in dates).

New Haven Colony

Theophilus Eaton	1639–58	William Leete	1661–65
Robert Newman	1658–60		

STATE GOVERNORS

Jonathan Trumbull	Federalist	1776–84
Matthew Griswold	"	1784–86
Samuel Huntington	"	1786–96
Oliver Wolcott	"	1796–98
Jonathan Trumbull	"	1798–1809
John Treadwell	"	1809–11
Roger Griswold	"	1811–13
John Cotton Smith	"	1813–17
Oliver Wolcott	Anti-Federalist	1817–27
Gideon Tomlinson	"	1827–31
John S. Peters	Whig	1831–33
H. W. Edwards	Democrat	1833–34
Samuel A. Foote	Whig	1834–35
H. W. Edwards	Democrat	1835–38
W. W. Ellsworth	Whig	1838–42
C. F. Cleveland	Democrat	1842–44
Roger S. Baldwin	Whig	1844–46
Isaac Toucey	Democrat	1846–47
Clark Bissell	Whig	1847–49
Joseph Trumbull	"	1849–50
Thomas H. Seymour	Democrat	1850–53
Charles H. Pond	"	1853–54
Henry Dutton	Whig	1854–55
W. T. Minor	Know-Nothing	1855–57
A. H. Holley	Whig	1857–58
W. A. Buckingham	Republican	1858–66
Joseph R. Hawley	"	1866–67
James E. English	Democrat	1867–69
Marshall Jewell	Republican	1869–70
James E. English	Democrat	1870–71
Marshall Jewell	Republican	1871–73
Charles R. Ingersoll	Democrat	1873–76
R. D. Hubbard	"	1876–79
C. B. Andrews	Republican	1879–81
H. B. Bigelow	"	1881–83
Thomas M. Waller	Democrat	1883–85
Henry B. Harrison	Republican	1885–87
Phineas C. Lounsbury	"	1887–89
Morgan G. Bulkeley	"	1889–93
Luzon B. Morris	Democrat	1893–95
O. Vincent Coffin	Republican	1895–97
Lorrin A. Cooke	"	1897–99
George E. Lounsbury	"	1899–1901
George P. McLean	"	1901–03
Abiram Chamberlain	"	1903–05
Henry Roberts	"	1905–07
Rollin S. Woodruff	"	1907–09
George L. Lilley	"	1909–
Frank B. Weeks	"	1909–11
Simeon E. Baldwin	Democrat	1911–15
Marcus H. Holcomb	Republican	1915–17
Marcus H. Holoomb	"	1917–19

Population and Finance.— The population of the State, as estimated by the United States census in 1916, was 1,244,497, showing a great increase in recent years, and making it fourth in rank, as to density. Of this population, about two-thirds are native born and one-third foreign born. In 1910, 3.8 per cent of the population was classed as illiterate, being the smallest percentage of any State except Massachusetts with 3.5 per cent of illiterates. The total grand list as computed in October 1916, by the State Board of Assessors, was $1,278,696,735. New Haven, Hartford and Bridgeport supply one-half of the grand list of the 19 cities. The receipts for the fiscal year ending 30 Sept. 1916 were $11,532,806.94; the expenses, $8,439,944.59.

Legislation.— In 1916, the State legislature was composed of 11 Democratic and 24 Republican senators; and 60 Democratic and 198 Republican representatives. Recent bills of importance include a Public Utilities Commission, Workmen's Compensation Act; one eliminating a congressman at large; the election of county commissioners by the people; the appointment of judges of the minor courts by the governor instead of the general assembly; the adoption of uniform laws as to the sales of goods and as to warehouse receipts, recommended by the Conference of Commissioners on United States Laws; bills to prevent infection with tuberculosis and to provide State hospitals for consumptives; to establish a State reformatory; appointing a public service corporation regulation commission; as to uniform bills of lading; establishing a State civil service law; strengthening the corrupt practices law; for a "blue sky law"; regulating the use of airships; taxing woodlands; a general bank incorporation law; creating a State civil service commission; repealing the exemption of charitable bequests from a succession tax; taxing corporations on income rather than on capital. In the presidential election of 1916, the State gave a Republican majority, and elected a Republican governor.

In 1917 under the auspices and direction of Governor Holcomb the State took a foremost place in war preparation and organization. A census of the resources of the State in men and materials was begun early in the year and complete returns were available by December. A home guard was established, numbering 20,000 members, of whom about half were fully equipped. By act of the legislature the governor received far-reaching powers, being authorized to take any steps he might deem necessary due to the emergency of the war. Commerce and manufactures throve after the opening of the war due to the fact that the State contained hundreds of factories which were engaged in the manufacture of war munitions. The legislature of 1919 will consider a constitutional amendment granting suffrage to women.

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William M., ‘Physical Geography of Southern New England’ (National Geographical Society Publications 1895).

Jonathan Trumbull,
Librarian of Otis Library, Norwich.

CONNECTICUT AGRICULTURAL COLLEGE, a coeducational institution situated at Mansfield, Conn., eight miles north of Willimantic. It was founded in 1881 by the Connecticut general assembly as the Storrs Agricultural School. It became a land-grant college and likewise, through the extensive work of its experiment stations, an important factor in the State. Its name was therefore changed to the one it now bears. It offers courses leading to degrees in agriculture, domestic science and the mechanic arts. It covers 874 acres and has 11 buildings. Important work in agricultural experiments and university extension is conducted here. The students number 214; instructors, 35.

CONNECTICUT COLLEGE FOR WOMEN, an institution for higher education at New London, Conn. It was chartered 4 April 1911. The curriculum includes instruction in the humanities, arts and sciences. It confers the degrees of A.B. and B.S. The campus comprises 340 acres. Elaborate plans have been perfected for the buildings, of which the architectural style is in general the domestic Tudor with some edifices in Collegiate Gothic. The college has received several generous gifts of money, including an endowment of $1,000,000 from the Hon. Morton F. Plant. In 1913 the trustees authorized the erection of an initial group of five buildings adequate for the use of the college at the outset. Construction has been proceeding on these and other buildings since early in 1914. The college opened in September 1915. Its foundation is due to the desire of the people of Connecticut to provide within the State adequate facilities for the higher education of women.

CONNECTICUT LAKES, four small lakes in the northern part of Coos County, N. H., which are connected with Connecticut River in the beginning of its course. They are named in numerical order, from southwest to northeast, the largest one, Connecticut Lake proper, being known as First Lake. The smallest two, Third Lake and Fourth Lake, which are very near the Canadian boundary, are the ultimate sources of the river.

CONNECTICUT RESERVE. See Western Reserve.

CONNECTICUT RIVER, a river of New England; it rises in Connecticut Lake on the northern border of New Hampshire, 2,000 feet above sea-level, forms the boundary between Vermont and New Hampshire and flows southward, passing through the western part of Massachusetts, the central part of Connecticut and falls into Long Island Sound. Its total length is about 350 miles, and its drainage basin is more than 11,000 square miles in extent. Its principal affluent is the Farmington which joins it above Hartford. Throughout its course between New Hampshire and Vermont the banks are wooded, the river bed very narrow and all affluents are small, but at certain seasons become so many torrents. The average fall in this upper course is from 18 to 32 feet per mile. After entering Massachusetts the river flows through Triassic shales and sandstones and the river valley becomes very broad. Near the Connecticut border and after its entry into the latter State the river has cut its way through heavy deposits of sand, gravel and clay of the late Glacial Period. This portion is also marked by several rapids and waterfalls; of these the principal are the Enfield Falls, 10 miles above Hartford. The river valley from Middletown to the sea is narrow, the stream here working through the crystalline rocks of the lowlands. The valley is a great manufacturing region, ample water-power being supplied by the river at many points, such as Bellows Falls, Vt., Turners Falls and Holyoke, Mass., and Windsor Locks, Conn. Below Brattleboro, Vt., a great power dam has been constructed recently by the Federal government. The latter has had elaborate surveys made with a view of rendering the river navigable as far as Holyoke. Subsidiary canals at present make it navigable for about 25 miles above Hartford, while from this city to the sea (50 miles) it is navigable for vessels drawing from 8 to 10 feet. The sand bars which are constantly forming at the mouth of the river are removed by dredging. In Colonial times the river played a prominent part in the settlement of the region. It was the highway for the English and Dutch fur traders, and the fertility of the lands along its banks soon attracted settlers. Until the advent of the railway it remained the principal thoroughfare between the northland and the sea. Consult Bacon, E. M., ‘The Connecticut River and the Valley of the Connecticut’ (New York 1906); Genth, M. K., ‘Valley Towns of Connecticut’ (American Geographical Society, Vol. XXXIX, No. 9, ib., 1907).

CONNECTICUT YANKEE IN KING ARTHUR'S COURT, a humorous tale by Mark Twain published in 1889. It is the story of a superintendent of an arms factory in Hartford, Conn., who one day lost consciousness from a blow received in a quarrel with his men, and when he awoke found himself in England at the time of King Arthur. The contact of Connecticut Yankeedom with Arthurian chivalry gives rise to strange results; yet amidst all the fun and pathos, the courtliness, the sincerity, and the stern virtues — as well as what seems to us the ridiculousness — of the age are well shown.

CONNECTIVE TISSUE, the most important supporting tissue of the body, derived like bone and cartilage from the mesenchyme of the embryo. It is made up of cells, which are relatively scanty, fibres and an intercellular ground substance secreted by the cells. The cells may be amœboid (in embryonic tissue), or may be the vacuolated so-called plasma-cells, or may assume a spindle-like or plate-like shape; and may contain pigment, granules of substance showing a peculiar affinity for certain dyes or fat. Besides these cells formed *in situ,* leucocytes often invade connective tissue. The white fibres of connective tissue are formed in bundles, are easily stained by acid fuchsin, yield gelatin on boiling, and are digested by artificial gastric juice, though not by pancreatin. The yellow fibres or elastic fibres, unlike the white branch and anastamose, are highly refractive, and during life, owing to the tension under which they are, are straight. They are only slowly digested by the gastric juice, but rapidly by the pancreatic juice. Orcein acts as a specific stain for elastic tissue. The so-called reticulum is made up of fibres much like the white fibres, but not so easily attacked by artificial gastric juice.

Embryonic connective tissue is made up of spindle-shaped and amœboid, stellate cells, with few fibres and, in the less mature tissues, all of these white. The ground substance is fluid. Embryonic connective tissue is found not only in fœti and infants, but also in tumors and during the regeneration of injured connective tissue.

Gelatinous connective tissue occurs only in the umbilical cord and in the vitreous humor of the eye. It contains plate-like cells and reticulum, sparse in the vitreous humor and relatively dense in the umbilical cord. The ground substance is gelatinous.

Areolar connective tissue occupies all otherwise unfilled regions. The white fibres form interlacing bundles. The elastic fibres are isolated and comparatively few in number. The cells are of all varieties. The ground substance is a fluid which can be coagulated by silver nitrate.

Dense white fibrous tissue consists mainly of parallel bundles of white fibres with plate-like cells in their interstices. Yellow fibres are scarce and there is little ground substance. This tissue forms most tendons, ligaments, fascial and muscular sheaths, and envelopes many of the viscera. The valves of the heart, the chordæ tendinæ and the tendinous rings about the mouths of the great vessels are all formed from white fibrous tissue.

Elastic tissue is made up of bundles of elastic fibres with sheaths of white fibres. It contains but little ground substance. It is found in the ligamenta subflava dorsal to the spinal column and in the ligamentum nuchæ supporting the head in the lower mammals.

Adipose tissue is composed of cells distended until they have become mere sacs of fat and of fibrous bands supporting these cells. It is found beneath the skin of many parts of the body, about the lymphatic nodes, adrenals and kidneys, in the mediastinum and the grooves of the heart wall, and in the mesentery and omentum.

Reticular tissue is found as the stroma of many glands and in bone marrow. Its tissue juice is lymph. It consists of a reticulum of fibres closely joined in anastomosing bundles, with cells of a plate-like nature at the points of bifurcation.

Lymphoid tissue is reticular tissue permeated by the close-packed spheroidal lymphatic corpuscles. Lymphoid tissue is found in the tonsils, spleen, thymus, lymphatic glands, and in Peyers patches and the solitary follicles of the intestine. More diffuse lymphoid tissue is found elsewhere in the respiratory and digestive tract.

Connective tissues are richly supplied with blood vessels and nerves. They are nourished by the lymph exuding from the blood capillaries. The waste products of metabolism are taken up by the lymph capillaries.

CONNELLEY, William Elsey, American author: b. Johnson County, Ky., 15 March 1855. Though almost entirely self-educated, he was for a number of years a school teacher in Kentucky and Kansas 1872–82. He went to Kansas in 1881 and was county clerk of Wyandotte County, 1883–88. For four years (1888–92) he was in the wholesale lumber business, and then engaged in banking. His leisure has been chiefly devoted to the study of the history and antiquities of the North American Indians, and the States of the Middle West. He compiled the first vocabulary of the Wyandot language, and has made valuable studies of the languages of the Delawares, Shawnees and other tribes. He is secretary of the Kansas State Historical Society. His papers have mostly appeared in the publications of the Ontario, Kansas, Nebraska and Ohio Historical societies, the Bureau of Ethnology and Smithsonian Institution. Some of their titles are 'The Provisional Government of Nebraska Territory' (1899); 'Notes of the Clan System of the Wyandots' (1899); 'Notes on the Folk-Lore of the Wyandots' (Journal of American Folk-Lore, 1900); 'James Henry Lane, the Grim Chieftain of Kansas' (1899); 'Kansas Territorial Governors' (1900); 'John Brown: the Last of the Puritans' (1900); 'The Overland Stage to California' (with Root, 1902); 'Doniphan's Expedition' (1907); 'Quantrill and the Border Wars' (1909); 'The Ingalls of Kansas' (1909); 'Eastern Kentucky Papers' (1910); 'Life of Preston B. Plumb' (1913).

CONNELLSVILLE, Pa., borough in Fayette County, on the Youghiogheny River, and the Baltimore and Ohio and the Pennsylvania railroads, 57 miles east of Pittsburgh. It is the centre of the most extensive coke-burning region in the United States. Until 1903 the coke output of this region was from 40 to 50 per cent of the total output of the United States. The estimated annual output is about 21,000,000 short tons. It also contains one of the largest lock factories in the country. Other important industries are machine shops, pump works, brick works and coal mining. In 1914 there were in operation 42 establishments, with a capital of $3,246,000, and giving employment to 1,246 persons. Salaries and wages paid during the year aggregated $818,000, and the value of the products $1,994,000, of which $1,205,000 had been added by manufacture. It is the seat of Cottage State Hospital. Settled in 1770, Connellsville was erected into a township and named in honor of Zachariah Connell, the founder, in 1793, and was incorporated as a borough in 1806. It is governed by a mayor, elected for three years, and a common council. Connellsville contains the grave of Edward Braddock, the Irish general with whom Washington fought in the French and Indian wars. Pop. 12,845.

CONNEMARA, kŏn-nę-mä'rą, Ireland («the Bays of the Ocean»), a boggy and mountainous district occupying the most western portion of county Galway, about 30 miles long and 15 to 20 miles wide. The scenery of its broken coastline is very grand; in the sea inlets there is an abundance of fish; and there are numerous small lakes. It is subdivided into Connemara Proper in the west, Jar-Connaught in the south and Joyce County in the north.

CONNERSVILLE, Ind., the county-seat of Fayette County, situated on the Whitewater River and on the Cincinnati, Cleveland, Chicago and Saint Louis and the Cincinnati, Fort Wayne and Louisville railroads. Among its features are a Carnegie library, a high-school building, Roberts Park and Fayette Sanitarium. Connersville manufactures automobiles, pianos, paper, gloves, brick, blowers, carriages, mirrors, furniture, triple signs, overalls and flour. The waterworks are owned by the city. It was incorporated in 1813 and is governed by a mayor, elected biennially, and a council. Pop. 7,738.

CONNERY, Thomas Bernard Joseph, American journalist: b. Ireland, 13 Oct. 1838. The greater part of his career was spent in the service of the New York *Herald,* on which he held nearly every position except that of financial editor, 1856–84. He was editor of New York *Truth,* 1885; *Once a Week,* 1893–95; *Collier's Weekly,* 1895. He was United States secretary of legation and *chargé d'affaires* in Mexico, 1866–68. He was a member of the New York Board of Education in 1902. He has published 'Don Tiburcio'; 'Black Friday'; 'History of American Comic Journalism'; 'Character Marks Autorial'; 'Essays on Literary Women of England'; 'All the Dog's Fault'; 'That Noble Mexican'; 'My Trip to Mars'; 'Violet Bland'; 'Forgotten Incidents: Lincoln's Visit to West Point'; also magazine articles.

CONNOR, Ralph. See GORDON, CHARLES WILLIAM.

CONNOR, Selden, American soldier: b. Fairfield, Me., 25 Jan. 1839. He graduated at Tufts College, 1859; enlisted as a private in the 1st Vermont regiment 1861; became lieutenant-colonel of the 7th Maine regiment 1861, colonel of the 19th Maine 1864, and brigadier-general of volunteers June 1864. He was present at the battles of Fredericksburg, Gettysburg and the Wilderness, where he was severely wounded. After the war he held several minor Federal offices, was governor of Maine 1876–78, United States pension agent 1882–86 and 1897. On 3 Oct. 1889 he delivered the oration at the dedication of the Maine monuments at Gettysburg. In 1890 he became president of the Society of the Army of the Potomac, in 1896–99 was senior vice-commander-in-chief of the Order of the Loyal Legion, and in 1897 was again appointed pension agent, continuing in this office until the abolition by law of all pension agencies in 1913. His address on 'Hannibal Hamlin' was published in 1909.

CONODONTS (Gr. "cone-teeth"), minute fossils found in Palæozoic strata. They look very like the teeth of different kinds of fishes, some being simple slender pointed sharp-edged cones, while others are more complex, resembling in form the teeth of certain sharks. The old opinion was that they are minute teeth of fishes allied to the living hag-fishes and lampreys, but it is more likely that they are the jaws of annelids and naked mollusks. Consult Zittel and Rohon, 'Ueber Conodonten' (in *Sitzungsberichte der königlich-bayerischen Akademie der Wissenschaften,* Munich 1886).

CONOID, *in geometry,* a surface generated by a straight line moving parallel to a given plane in such a manner that it constantly touches a curve and a straight line; more generally, a surface generated by a line through two given straight lines and a given curve.

CONON, Athenian commander: d. after 392 B.C. Having been defeated in a naval engagement at Ægospotamos by Lysander, he for a time went into exile; but being aided by Artaxerxes, king of Persia, he returned and defeated the Spartans near Cnidus 394 B.C. Conon then began to rebuild the fortifications of Athens, and restored it to liberty and security.

CONON, of Samos, Greek astronomer and mathematician who lived in the 3d century B.C. He was a friend of Archimedes and invented the curve known as the Spiral of Archimedes. His works do not survive, but the main testimony to his genius is found in the laudatory comments in the surviving works of Archimedes.

CONQUEST, Ida (Mrs. Riccardo Bertelli), American actress: b. New York, June 1882. Her first stage experience was at the age of eight, when she appeared as Little Buttercup in the Boston Museum juvenile production of 'Pinafore,' a part she played over 300 times. Her professional début was made in 1894 as Constance in 'The Transgressor,' with Olga Nethersole, in Palmer's Theatre, New York. She had an ingénue part with the Empire Stock Company in 1896; and was leading lady with John Drew in 'Tyranny of Tears,' 'Second in Command' and 'Richard Carvel,' 1902; leading lady with William Gillette in 'Sherlock Holmes'; with Nat Goodwin as Helena in 'Midsummer Night's Dream,' 1903; starred with Charles Frohman in 'Girl with the Green Eyes,' 1904, and was leading lady with Richard Mansfield in 'Old Heidelberg,' 'Ivan the Terrible,' etc. She was leading lady with William Collier in 'On the Quiet,' 1905; appeared as Ann Whitfield in 'Man and Superman,' 1906, and later played in 'The Wolf' and 'A Little Brother of the Rich'; appeared with Nazimova as Asta in 'Little Eyolf,' 1910; and starred in 'The Talker,' 1911; after which she retired from the stage. She married Cavalier Riccardo Bertelli, of Genoa, Italy, 23 Oct. 1911. Others of her parts are Phyllis Lee, in 'The Charity Ball'; Carey, in 'Alabama'; Sybil, in 'The Dancing Girl'; Renée de Cochefort, in 'Under the Red Robe'; Babiole, in 'The Conquerors.' Consult Strang, 'Famous Actresses of the Day.'

CONQUEST, Right of. The appropriation of an enemy's territory by military occupation. In ancient times such occupation immediately passed title to the conqueror, but in modern times military occupation alone does not give such title to the invader. Title passes only when the invader manifests his intention of appropriating the territory by formal annexation, and when the acquiescence of the state from which it is taken shows the conqueror's ability to retain it. The Hague Conferences of 1899 and 1907 expressly detailed the rights and duties of the occupying power in 'Conventions Concerning the Laws and Customs of War on Land,' according to which the conqueror assumes ownership of all public property in occupied territory, and assumes the rights and obligations of the ousted state. The citizens of such occupied territory transfer their allegiance to the conqueror, although in modern times they are given the choice of leaving the territory if they refuse to swear allegiance to the new government. See DIPLOMATIC RELATIONS of the United States with the principal foreign nations; BELLIGERENT; WARS OF THE UNITED STATES.

CONQUEST OF MEXICO, The, a noted history by William Hickling Prescott, published 1843.

CONQUEST OF PERU, The, a history published by William Hickling Prescott (1847). Of the five books into which this work is divided, the first treats of the wonderful civilization of the Incas; the second of the discovery of Peru; the third of its conquest; the fourth of the civil wars of the conquerors; and the fifth of the settlement of the country. The first book hardly yields in interest to any of the others, describing as it does, on the whole, an unparalleled state of society. From the necessities of its material, the work is more scattered in construction than is the 'History of the Conquest of Mexico,' usually regarded as the author's most brilliant production.

CONRAD I, Emperor of Germany; d. 23 Dec. 918. He was elected king of Germany in 911; but Arnulf, Duke of Bavaria, and Henry, Duke of Saxony, disputed this title, and engaged the Huns to overrun Germany. Conrad, who was favored and supported by the Church, is said to have received a mortal wound in combat with these revolted chiefs, who were almost independent of the Crown, and the obedience of whom, therefore, Conrad was unable to command or win by other means. He is chiefly noteworthy for the revival in his case of the elective title to the crown.

CONRAD II, Emperor of Germany: b. about 990; d. Utrecht, 4 June 1039. He was the son of Henry, Duke of Franconia, and was elected king of Germany in 1024. Attempts were made to displace him, but without success, and in 1027 he was crowned emperor at Rome, in the presence of Canute, king of England, and Rudolph, king of Burgundy. He is regarded as the true founder of the Franconian or Salic line. He was often engaged in contests with the greater barons and princes of the empire, and endeavored to form a counterpoise to their influence by encouraging the formation of minor independent fiefs. With the same view he endeavored to appropriate several of the larger duchies to members of his own family, and thus convert the elective empire into a hereditary monarchy similar to that of France. These designs, though conducted with considerable ability, failed, mainly in consequence of the incessant contests in which he was engaged with the popes. He crossed the Alps in 1026, defeated the Italians and had himself crowned king of Italy at Milan. After a war which occupied most of the years 1032–34 he conquered Burgundy and made it a part of his empire.

CONRAD III, Emperor of Germany: b. 1093; d. Bamberg, Germany, 15 Feb. 1152. He was the founder of the house of Hohenstaufen; and was elected emperor in 1138. His title was disputed by Henry the Proud, Duke of Saxony, and the rivalry of these two princes was the germ of the factions afterward so famous under the names of Guelfs and Ghibellines. In 1146, at the Diet held at Spires, Conrad was persuaded by the eloquence of Saint Bernard to undertake a crusade, on which he set out the following year at the head of a large army. It was fruitless and disastrous, and Conrad returned with the wreck of his army in 1149.

CONRAD IV, Emperor of Germany: b. Andria, Italy, 25 or 27 April 1228; d. Lavello, Italy, 21 May 1254. He was chosen king of the Romans in 1237, but was never crowned; was a son of the great Emperor Frederick II, and like him excommunicated by the Pope, Innocent IV, who set up a rival emperor in William, Count of Holland. On the death of his father in 1250, Conrad marched into Italy to recover the towns which had declared against him. He took Naples, but could not get the investiture of the kingdom of Sicily from the Pope. In the midst of his troubles and contentions, he died of fever.

CONRAD V, or CONRADIN OF SWABIA, German prince: b. 1252; d. Naples, 29 Oct. 1268. He was the son of Conrad IV, and the last of the Hohenstauffen. He accepted the invitation of the Italian Ghibellines to place himself at their head and the sale of a large portion of his possessions enabled him to raise troops. In the autumn of 1267 he crossed the Alps with 10,000 men, and at Verona was warmly received by the Scala family, the chief of the Ghibelline party. His relatives here, persuading him to part with his remaining possessions at a low price, deserted him with their followers, leaving but 3,000 men. The Ghibellines, however, remained true to him. Verona raised a large army, Pisa a fleet, and Rome, whose pontiff was forced to flee to Viterbo, opened its gates to him. Conradin entered lower Italy, and at Tagliacozzo met the French army under Charles d'Anjou, on whom the crown of Naples had been bestowed by Pope Urban IV. He beat Charles back, and his men, supposing the victory won, dispersed in search of plunder, when they were attacked by the French and utterly routed, 23 Aug. 1268. Conradin escaped, but was betrayed into the hands of Charles at Astura, who caused him to be beheaded in the market place of Naples. His extreme youth, his unfortunate fate and the stories that clustered about him made him a good and favorite subject of poetry and more especially of the drama.

CONRAD, Charles M., American soldier and statesman: b. Winchester, Va., about 1804; d. New Orleans, La., 11 Feb. 1878. He went with his father to Mississippi, and thence to Louisiana while an infant, received a liberal education, studied law, was admitted to the bar in 1828 and practised in New Orleans. He served several years in the State legislature, was elected to the United States Senate as a Whig in the place of Alexander Mouton, who had resigned, and served from 14 April 1842 to 3 March 1843. In 1844 he was a member of the State Constitutional Convention. He was elected to Congress in 1848, and served until August 1850, when he was appointed Secretary of War by President Fillmore, serving from 13 Aug. 1850 to 7 March 1853. He was one of the leaders of the Secession movement in Louisiana in December 1860, a deputy from Louisiana in the Montgomery provisional congress of 1861, a member of the first and second Confederate congresses of 1862–64, and also served as brigadier-general in the Confederate army.

CONRAD, Frederik Willem, Dutch engineer: b. Delft 1769; d. 1808. He was the pupil and friend of Brunings, who did so much for the construction of the sea dykes of Holland, and on his death succeeded him in his situation of inspector-general of sea dykes in the province of Rynland. He afterward held the office of administrator-general of the sea dykes in the Low Countries. He rendered a lasting service to his country by reclaiming large tracts of land from the sea, and more especially by the formation of a proper outlet for the waters of the Rhine.

CONRAD, kōn'rät, **Johannes,** German political economist: b. West Prussia 1839; d. Halle, 21 May 1915. He was educated at the universities of Berlin and Jena. He was made professor of political economy at the latter institution in 1870 and at Halle in 1872. He was a member of the second commission appointed to revise the German Civil Code and took a prominent part in its deliberations. In 1878 he was appointed editor of the *Jahrbücher für Nationalökonomie und Statistik* and associate editor of the *Handwörterbuch der Staatswissenschaften* (1889–95; 2d ed., 1898 et seq.). He has published ‘Das Universitäts-studium in Deutschland während der letzten fünfzig Jahre’ (1884; Eng. trans. by Hutchison, with preface by James Bryce, 1885); ‘Grundriss zum Studium der politischen Oekonomie’ (1896–1909); ‘Leitfaden zum Studium der Nationalökonomie’ (1901).

CONRAD, Joseph, English novelist: b. Poland 1856, the son of a Polish revolutionist. He was educated in Cracow, and at 13 went to sea, becoming subsequently a captain in the merchant service. After a long experience as a sea rover, he settled in England and began putting his various experiences into literature. His writings include ‘Almayer's Folly’ (1895); ‘An Outcast of the Islands’ (1896); ‘The Nigger of the Narcissus,’ issued in America as ‘The Children of the Sea’ (1897); ‘Lord Jim’ (1900); ‘The Inheritors’ (with F. M. Hueffer, 1901); ‘Youth and Other Tales’ (1902); ‘Typhoon’ (1902); ‘Mirror of the Sea’ (1906); ‘A Set of Six’ (1908); ‘Under Western Eyes’ (1911); ‘Twixt Land and Sea’ (1912); ‘Chance’ (1914); ‘Within the Tides’ (1915).

CONRAD, Robert Taylor, American lawyer and dramatist: b. Philadelphia, 10 June 1810; d. there, 27 June 1858. He wrote for the press of Philadelphia; was a member of the Court of Criminal Sessions; and on its dissolution became editor of *Graham's Magazine* and associate editor of the Philadelphia *North American*. He was mayor of Philadelphia and judge of the Court of Quarter Sessions (1856–57). He wrote ‘Aylmere’ (1852), a tragedy in which Edwin Forrest played the rôle of Jack Cade; ‘Conrad of Naples,’ a tragedy; ‘Poems’ (1852).

CONRAD, Timothy Abbott, American palæontologist: b. Philadelphia 1803; d. there, 1877. In his youth he followed the occupation of publisher and printer in his father's shop. He became interested in natural history, and published papers on marine conchology in 1831; and in 1832 began to publish in parts his work on the fossil mollusks of the Tertiary formations of North America, which was the beginning of systematic research in that department. He became State geologist of New York in 1837, and worked as State palæontologist from 1838–41, issuing during that time his serial monograph on the *Unionidæ* of the United States. It is upon this work and subsequent papers that his excellent fame rests. He finally returned to Philadelphia. Consult Merrill, in ‘Report of the United States National Museum for 1904’ (Washington 1906).

CONRADER, kōn'rä-dĕr, **Georg,** German painter: b. Munich 1838; d. 1911. He studied under Foltz and Piloty at the Munich Academy. He first came into notice with ‘Tilly in the Grave-Digger's Dwelling’; On the Eve of Breitenfeld’ (Kunst Halle, Hamburg). Other well-known and much-admired works by him are ‘The Destruction of Carthage’ (Maximilianeum, Munich), ‘Hauer Painting Charlotte Corday in Prison,’ ‘The Death of Joseph II,’ and portraits in the Budapest National Museum.

CONRADIN OF SWABIA. See CONRAD V.

CONRIED, Heinrich, American impresario: b. Bielitz, Austrian Silesia, 13 Sept. 1855; d. Meran, Tyrol, Austria, 27 April 1909. Graduating from the Oberrealschule of Vienna, he came to the United States, and was for several years a manager of German theatrical and operatic organizations. As director of the Irving Place Theatre, New York, he became known for excellent presentations of German classic drama, frequently repeated at Cambridge and other university centres. In 1903 he became director of the Metropolitan Opera-house, where he presented Wagner's ‘Parsifal’ for the first time outside Bayreuth. He resigned in 1908. Consult Moses, M. J., ‘Life of Heinrich Conried’ (New York 1916).

CONRING, kōn'rĭng, **Hermann,** Dutch scholar: b. Norden, East Friesland, 9 Nov. 1606; d. Helmstedt, Brunswick, 12 Dec. 1681. He studied at Helmstedt and Leyden, devoting himself chiefly to theology and medicine; was appointed in 1632 professor of philosophy at Helmstedt, in 1636 professor of medicine, and remained in this city until his death. He was distinguished in almost every department of knowledge, and the title of a councillor was conferred on him by the kings of Denmark and Sweden and the elector of the Palatinate. He was then made professor of law. The German emperor likewise distinguished him. From far and near his advice was sought in political and legal cases. He did a great deal in compiling of the history of the German Empire, and for the improvement of German public law, in which he opened a new path. He wrote ‘De origine juris Germanici’ (1643); ‘Exercitationes de re publica Germanica’ (1675); and very many other treatises to the number of over 100. His works, with his biography, were published in 1730. Consult Stobbe, ‘Hermann Conring, der Begründer der deutschen Rechtsgeschichte’ (Berlin 1870); Goldschlag, ‘Beiträge zur politischen und publizistischen Tätigkeit H. Conrings’ (Berlin 1884).

CONSALVI, kōn-säl'vē, **Ercole,** Italian statesman and cardinal: b. Toscanella, 8 June 1757; d. Rome, 24 Jan. 1824. Having in 1797 entered the public service of the court of Rome in an humble capacity, he was four years later one of the 12 auditors of the Rota, a commission in effect a supreme court of appeal in all matters secular as well as ecclesiastical. When the French took possession of Rome, Consalvi, falsely accused of having had part in an assassination, was for a while held in prison and then banished. When Pius VI died, Consalvi was largely instrumental in procuring, in the conclave held at Venice, the election of Cardinal Chiaramonti to the papal throne as Pius VII, and thereafter was that pontiff's chief counsellor; he was now second only to the Pope in all dealings with the European powers and specially with Napoleon. In the course of the controversies between Rome and the French emperor, he showed a firmness that won him the unwilling respect indeed of Napoleon, but also his irreconcilable enmity. It was while the Emperor was flushed with the victory of Austerlitz that he sent to Consalvi through Cardinal Fesch the message, “Tell Consalvi that if he loves his country he must either resign or do what I demand”; and the cardinal prudently withdrew from public life for a season. In 1809 he had an interview with Napoleon at Paris, in which the Emperor in effect made an apology for that act; but Consalvi persisted in his opposition to Napoleon's designs; and was one of the 13 cardinals who refused to concede the lawfulness of the second marriage of Napoleon. In punishment of his obstinacy in that matter he was held in confinement three years at Rheims. After the fall and banishment of Napoleon, he resumed his station in the papal court and devoted himself to the institution of many reforms in the government, being in effect chief governor of Rome and the papal states. He was always a liberal patron of art, literature and science. He left the bulk of his property to the poor. Consult Crétineau-Joly, ‘Mémoires du Cardinal Consalvi’ (Paris 1895).

CONSANGUINITY, relationship of persons descended from the same ancestry or common stock. Consanguinity may be either direct (known also as lineal) or collateral. Consanguinity is direct when the relationship is that which exists between ascendants and descendants, as grandfather, father, son. It is collateral when the relationship is that which exists between persons who have the same ancestor but who are the issue of different children, as first cousins. Various degrees of consanguinity are recognized by law, but the manner of computing collateral consanguinity varies with the locality, depending on whether the civil or the canon law is followed. In the civil law the degrees from the common ancestor are numbered on both sides, brothers thus being related in the second degree and first cousins in the fourth. In the canon law, which is the same as the common law in this particular, the steps between the remoter person and the common ancestor are counted, brothers thus being related in the first degree and first cousins in the second degree. The rule for computing the degree of lineal consanguinity is the same for the canon, civil and common law. English law and the law of most of the States in this country follow the canon law in reckoning downward from a common ancestor. Consanguinity is an important question in the law of marriage, inheritance and descent, certain crimes as incest, and in determining the disqualifications of judges, jurors, etc. The term consanguinity must be carefully distinguished from affinity, which latter term means relationship by marriage, either through the husband or wife, and not through a common ancestor. See Descent in Law; Inheritance.

CONSCIENCE, kôn-syäñs, **Hendrik**, Belgian novelist: b. Antwerp, 3 Dec. 1812; d. Brussels, 10 Sept. 1883. He was mostly self-educated. He entered the army in 1830 but resigned in 1836 and in the following year published his first novel in Flemish, ‘In the Wonderful Year 1566.’ It was a great success but the author was left under a burden of debt to his printer. ‘Phantasy’ and ‘The Lion of Flanders’ followed soon after. Conscience was one of the first to use Flemish as a medium of literary expression and his example heartened others, who had less patriotic courage, to do likewise. It also secured for him a measure of government patronage, being granted a post in a government office. He abandoned this for gardening and soon afterward was appointed to a post at the Royal Academy of Painting. In 1845 he was made associate professor at Ghent and instructor in Flemish to the royal children, and in 1868 became custodian of the Wiertz Museum. He published in all over 100 volumes and the occasion of the publication of his 100th volume in 1881 was made a national celebration. His historical novels are inferior to his works dealing with Flemish home life, which he knew. In addition to those noted above his most noteworthy works are ‘How One Becomes a Painter’ (1843); ‘Poor Nobleman’ (1851); ‘The Good Luck to be Rich’ (1855); ‘Duke Carl's Justice’ (1876); and ‘Benjamin of Flanders’ (1880). (See Lion of Flanders, The; Rikki-Tikki-Tak). Consult the biographies by Eeckhoud (Brussels 1881) and Pol de Mont (Haarlem 1883).

CONSCIENCE, the mental basis of our judgments of moral obligation. The conscientious examination of a course of action consists in: (a) the fullest possible inquisition into the motives, results and other bearings of the action; (b) the approval or disapproval of the entire course of action in the light of this inquisition. The act of approval or disapproval does not appear to be essentially different in character from that involved in judgments of taste or of pleasure or the dicta of prejudice. It is the vastly wider scope of the preliminary examination, together with the fact that its judgments are most usually concerned with conduct and its principles, which marks conscientious judgments off from all others of a normative nature. See Ethics; Norm.

CONSCIENCE MONEY, stolen or wrongfully acquired money returned to its rightful owner when conscience is awakened to a sense of right dealing. In the United States such money paid into the treasury at Washington by self-avowed debtors anonymously is known as the conscience fund. In England the phrase is applied to money forwarded, as a rule anonymously, to the Chancellor of the Exchequer for unpaid income tax. It amounts to some thousand pounds a year.

CONSCIOUSNESS (Ger. *Bewusstsein;* Fr. *conscience;* It. *conscienza*) is the term by which psychology distinguishes one of the two great categories into which experience falls, viz., *mental experience,* from the other, *physical experience.* The one division, mental experience, includes all facts that may be construed as *subjective,* the other division all facts that are considered by the uncritical mind to be *objective.* From time immemorial the former order of experiences has been customarily held to constitute a series of immaterial sequences that in their totality construct a personal life history; the latter has just as stoutly been looked upon as forming a causal chain of events in a material world external to but reflected by the mental series. This picture of *mind* in reciprocal relationship with an *external world* portrays the naïve dualism of common-sense thought.

Regarded analytically consciousness breaks up into a series of processes producing sense-percepts, images of memory and imagination, associations, judgments, reasonings, feelings, emotions and volitions. Regarded from the standpoint of their totality these processes of consciousness constitute an individual mental history or mind. The objective facts above alluded to form the content of consciousness, forming in their entirety the world of external realities, a world distinguished into the two great subdivisions of living and non-living nature.

There is probably no term in the nomenclature of psychology that is subject to such vagueness of reference and ambiguity of meaning. Professor Ward has declared it to be "the vaguest, most protean, and most treacherous of psychological terms." Alexander Bain in his day discovered that it had already acquired thirteen distinct meanings, and he would doubtless find additional ones were he conversant with the vastly increased psychological literature of the present time. Considering this lack of fixity in meaning it seems almost audacious to attempt an accurate definition. But, holding the term to its most important significance, one may define consciousness as *the aggregate of the mental processes of any period of life.*

The question of the relation of consciousness to other biological functions is one of great importance but one upon which present scientific knowledge throws little light. There is every reason to believe that states and degrees of consciousness are directly correlated with the activities of the nervous system, and especially with the functions of the great master-ganglion, the cerebrum. The evidence in question can be but briefly mentioned in this article. It is along two lines. First, comparative studies of the nervous systems of animals reveal the fact that their complexity increases *pari passu* with their level in the evolutionary series in other aspects of structure, and that with complexity of nervous system goes increasing intelligence in adjustive behavior. This is especially true of the cerebrum, the part of the nervous system that undergoes greatest elaboration as the animal scale is ascended, and also admits of the highest degree of organization under stress of the life experiences of each individual. Second, experimental studies on the nervous systems of the lower animals, supported by pathological evidence in the case of man, lead to the conclusion that the several conscious processes are conditioned upon neural activity of a definite kind. Furthermore, functions have been accurately located in special cerebral areas, impairment of which results in a decrease or cessation of the correlated form of consciousness. Collateral evidence is also to be found in the facts of sleep and hypnosis. The cerebrum during profound slumber has a lowered blood circulation, probably has a lessened rate of metabolism, and is analogous to an important part of a mechanism temporarily out of gear with the rest of the system. Likewise during sleep consciousness completely or partially disappears. The hypnotic state gives indications pointing in the same direction, though knowledge of the cerebral condition during hypnosis is so slight that one can speak only conjecturally. The hypnotic subject appears to the observer to have an artificially delimited consciousness. His attention is acute within a narrowed field of stimulation. He is oblivious to all suggestion outside of this restricted range. When restored to normal condition there is usually a more or less complete forgetfulness of what took place under the hypnotic spell, analogous to the usual treacherous memory for dreams when recall is attempted some time after awaking from sleep. It is probable that there is a corresponding splitting off of cerebral activities into minor disconnected systems, some of them heightened into intense activity at the expense of others which become partially or completely somnolent.

Psychological self-examination (introspection) coincides with the verdict of common-sense in distinguishing degrees of consciousness. That such degrees are to be found in the ascending animal scale is the inevitable inference from comparative studies of nervous mechanisms and of animal and human behavior. Evidence leading to the same conclusion comes from the scientific observation of a normal human being from earliest infancy to maturity. Further proof is found in the normal experiences of sleep and waking as well as in the unusual ones of swooning and anæsthesia. The characteristic mark of consciousness at the lowest ebb is perceptual chaos and vagueness. The signs of full consciousness are great clearness and vividness. A high degree of consciousness is hence practically identical with focalized attention, whereas a low measure of consciousness is similar to fleeting or scattered attention. It would seem from this that consciousness and attention are terms with essentially the same meaning.

Whereas older conceptions of consciousness regarded its contents as furnished entirely by sense-impressions, by intellectual intuitions, or by both together, more modern views have called attention to the contributions made by bodily movements. Recent views maintain that the stream of consciousness is a composite of external factors derived through sense and of other elements furnished by bodily movements and activities. These movements give rise to so-called kinæsthetic (movement) sensations. All perceptual judgments, for example, are conditioned upon strains and tensions that blend with the other contributions of sense to construct the objects of our world. The content of consciousness is just these objects or things plus the residue of memory-images, images of imagination and ideas which form the sum-total of conscious experience.

The last statement leads to a reiteration of the fact that consciousness always has content. The content includes all the mental acts by which life adjustments are carried on, such as sense-percepts, images, thoughts, acts of will and feelings. Consciousness is thus seen to embrace all the concrete elements of mental life. Its function would seem to be the biological one of securing superior and far-reaching adjustments. It emerges at some unknown level in the animal scale in response to the necessities of living imposed by increasing complexity of structure. It is sharply contrasted with the purely nervous mechanisms of reflex, impulse and instinct. The acquired mechanisms of habit are usually preceded by a conscious stage of learning in which there is a temporary guidance of ideation, but lapse completely into the non-conscious when perfected. So likewise of other psychic functions when the psychic shock of initial performance is dulled through inveterate use. From this fact it is manifest that consciousness is par excellence the organ of intelligent action. It is stocked with the percepts, images and concepts by means of which a more salutary contact with the world about us is secured.

A closing word is required to speak of a very convenient antithesis to consciousness, *the subconscious*. Titchener defines it as «*an extension of the conscious beyond the limits of observation.*» (‘A Beginner's Psychology,’ p. 326). The concept has proved its usefulness in abnormal psychology, especially in the departments of psychiatry and psychotherapy. The insane are often found to be dominated by complexes taking the form of dominant ideas and acting as urgent forces that overmaster self-control. Hysterical subjects exhibit similar compulsive psychoses of such power as to produce elaborate and persistent hallucinations. Oftentimes there is no memory of the original experiences out of which these complicated mental structures are pieced together by a diseased imagination. It is convenient to assume that the building up of these mental edifices of imagery takes place somewhere behind the veil, much as the apparent dream imagery may be assumed to have been thrown into form behind the curtain of profound slumber before it is marshalled into the presence of the hazy consciousness of the partially aroused dreamer. The investigations of such eminent psychopathologists as Freud and Jung tend to confirm the significance of the subconscious as a convenient working hypothesis. It can scarcely be more; for direct evidence of its existence seems logically impossible.

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William J. Taylor,
The Brooklyn Training School for Teachers.

CONSCIOUSNESS, Biological Aspects of. Apart from subtle metaphysical or abstract psychological distinctions we shall arbitrarily conceive of consciousness as those directing cerebral mechanisms which handle life's energy for the production of useful work, the word useful being used in an extremely broad sense. Just how consciousness grew out of tropisms, what its subtle distinctions may be from reflexes, what are its relations to the unconscious, these are matters which for the present lie outside of this discussion. It is here assumed that consciousness is a higher evolutionary product, assuming greater and greater control and precision as the opportunities and needs for adaptation to reality grow in the advancing animal scale. That consciousness may still be made a better and better instrument for adaptation to reality goes without saying.

Adaptation to reality is a complex function of the cerebral mechanism and we may follow Bergson in saying that it is through both instinct and intelligence that this takes place. In intelligent or logical activities consciousness is assumed. Is there a consciousness in instinct? This question brings one back to the matter of tropisms, of reflexes, and of the unconscious. To present this latter problem Bergson assumes two kinds of unconsciousness, one in which consciousness is an absent factor and one in which consciousness is merely nullified. As he says both are equal to zero, but in one case zero expresses the fact there is nothing, in the other that there are two equal quantities of opposite sign which compensate and neutralize each other. Thus one may speak of the unconsciousness of a falling stone. Instinct however has a different type of unconsciousness. When one performs an habitual action, when a somnambulist automatically acts out a drama, as did Lady Macbeth, unconsciousness may be absolute and yet of what does it consist. Bergson holds with reason that the representation of the act itself resembles the idea so perfectly, and fits it so exactly, that consciousness is unable to find room between them. Freud, Jung and Bleuler would speak of this as a special kind of thinking in which consciousness is suppressed into unconsciousness by reason of emotional blocking. Fantasy thinking or autistic thinking results. The dramatization is the action and as Bergson shrewdly notices the representation is stopped by the action. As proof this latter author calls to mind the fact that if the accomplishment of the act is arrested or thwarted by an obstacle, consciousness may reappear. It was there but neutralized by the action which fulfilled, thereby filled the representation. This inadequacy of act to representation is what Bergson calls consciousness. He is worth quoting further on this point since much of the knowledge of psychopathology gained by psychoanalysis tends to confirm a part of his attitude. If this point be examined more closely, it is found that consciousness is the light that plays around the zone of possible actions or potential activity which surrounds the action really performed by the living being. It signifies hesitation or choice. Where many equally possible actions are indicated without there being any real action (as in a deliberation that has not come to an end), consciousness is intense. Where the action performed is the only action possible (as in activity of the somnambulistic or more general automatic kind), consciousness is reduced to nothing. Representation and knowledge exist none the less in the case if a whole series of systematized movements are found, the last of which is already prefigured in the first, and if, besides, consciousness can flash out of them at the shock of an obstacle. From this point of view, the consciousness of a living being may be defined as an arithmetical difference between potential and real activity. It measures the interval between representation and action.

It may be inferred from this that intelligence is likely to point toward consciousness, and instinct toward unconsciousness. For, where the implement to be used is organized by nature, the material furnished by nature, and the result to be obtained willed by nature, there is little left to choice; the consciousness inherent in the representation is therefore counter-balanced, whenever it tends to disengage itself, by the performance of the act, identical with the representation which forms its counterweight. Where consciousness appears, it does not so much light up the instinct itself as the thwartings to which instinct is subject; it is the deficit of instinct, the distance between the act and the idea that becomes consciousness, so that consciousness, here, is only an accident. Essentially, consciousness emphasizes only the starting point of instinct, the point at which the whole series of automatic movements is released. Deficit, on the contrary, is the normal state of intelligence. Laboring under difficulties is its essence. Its original function being to construct unorganized instruments, it must, in spite of numberless difficulties, choose for this work the place and the time, the form and the matter. And it can never satisfy itself entirely, because every new satisfaction creates new needs. In short, while instinct and intelligence both involve knowledge, this knowledge is rather *acted* and unconscious in the case of instinct, *thought* and conscious in the case of intelligence. Before discussing this subject further a glance at the organs in which these mechanisms are concentrated may aid in fashioning a workable concept.

Cerebral Localizaton.— The general biological principle of the concentration of energy as a feature of advanced evolutionary development finds its expression for the psychical sphere in the more or less distinct localization of definite functions to certain portions of the brain.

For the purely vegetative activities such localization is as yet indefinite, but it is known that the areas governing the various members are accurately located. The important sense organs also show a like integration, and the localization of so-called centres for sight, hearing, smell and motor speech now admits of little question.

It is, by more or less common consent, based on general grounds, as well as on the data afforded by physiological experiment and pathological observation, as well as by the study of the comparative psychology of the lower animals (by Romanes, Darwin, Morgan, Mills and Thorndike), that the higher mental processes (i.e., those that are more complex and those which have developed late in the evolution of the race) utilize the frontal lobes of the brain in their activities; but it is certain that, so far as the ego is concerned, taken in its totality, no such localization can exist. The whole body is a psychical organ, and the sense of the ego depends on such a multitude of sensory impressions that its location is coexistent with the nervous system in its totality. It is to be borne in mind that the complex nexus of associational fibres should be considered constant factors in the idea of a consciousness. The great modifications that occur in consciousness — due to the cutting out of action of certain of such associated fibres — is a constant feature in certain hemiplegic states, and probably some similar pathological entities lie at the foundation of some of the modifications of consciousness in some of the psychoses, notably general paresis.

Within recent years the labors of the histopathologists have brought into prominence the importance of minute structural changes of the connections of the various nerve processes; collaterals, axis cylinders and dendrites, forming plexuses of communication between various systems of nerve-cell groups. Such changes are closely correlated and are probably direct causative agents of many of the symptoms of mental disease, such as loss of attention, diminished initiative, amnesia, blunting of the higher ethical ideas, insomnia, and many of those psychical activities which modify conduct so largely, and hence are representative of the empirical ego.

From such a purely preliminary sketch it can be seen that it is futile to attempt to speak of a localization of consciousness as if such a faculty were a thing *per se* rather than a function of psychical nerve activities.

Connected, however, with this question there are to be considered certain localizations of some of the more clearly defined psychical activities.

Evidence derived from the lower animals points to the fact that following the cutting out of the prefrontal lobes there is more or less mental degradation. Close attention is lost, and observation which looks for the safety of the animal is often notably affected. Attention, judgment, memory and notably inhibition are factors of the ego which are greatly modified by disease or injury to the frontal lobes, and with such are associated hesitation, fear, uncertainty and motor restlessness due to impaired inhibition.

Studies of monsters without a brain have shown that without a cortex, but yet possessing enough of the cerebrospinal mechanisms to bring spino-thalamobulbar fibres into play, many automatic activities may take place, notably sucking. Goltz's celebrated decerebrate dogs and the later studies of Rothmann also have shown that highly complex reflex activities may be carried out by these pallium-minus dogs. Hence one may say that certain instinctive activities persist but no intelligent ones. In these instinctive activities there is that type of unconsciousness already spoken of as represented by the absence of consciousness. The thwartings to which the instinct is exposed in this case cannot give rise to consciousness. See Consciousness; Consciousness, Disorders of.

Smith Ely Jelliffe.

CONSCIOUSNESS, Disorders of. From the unconsciousness of death and that of accident, and the profound intoxications, to sleep; through the mild grades of unconsciousness in many of the sleep phenomena, somnambulism, the hypnotic state, and its allies; through normal walking consciousness; through the active states of dramatic abandon, ecstasy, the minor intoxications, to the distinctly diseased emotional states of hysteria and epilepsy and the psychoses, finally to the living death of dementia, there is the gamut of the human psychical activities divided into a few cardinal categories which admit of general classification.

Just what shall constitute a normal state and what an abnormal state must be left largely to study of majorities. Conduct is the great criterion of consciousness, and for most practical purposes it may be assumed that disordered consciousness is correlative with disordered conduct.

In discussing the subject of disordered consciousness it has been the custom to describe three types: exalted, diminished and perverted states. While this classification is extremely convenient for many purposes, it fails to give an idea of the clinical significance of any particular phase. It is only too frequently the case that the same clinical groups, hysteria or epilepsy, for example, will demonstrate all these separate states, which at times merge within each other or follow one another with bewildering rapidity.

The more important question seems to be: Given a definite mental state, which, judged from conduct, departs so far from what a broad experience teaches to be a fairly average state, to what factor or factors is such an abnormal state due, into what category does it fit, and how can it best be regulated or controlled to ensure the best results to the individual and to society?

The subject of categories of the clinical groupings of such disordered conscious states will be here only touched upon. Such a problem in classification is manifestly extremely difficult because of the richness of the emotional content of consciousness, and the few rather broad categories here proposed are to be regarded purely in the light of general convenience rather than as attempts to cover the entire ground.

The disorders of consciousness for the present purposes are broadly divided into a few general groups. There are: (1) Disorders of sleep and the allied phenomena; (2) disorders of the neuroses and psychoneuroses, including the phenomena of automatism, double personalities, amnesia, etc.; (3) the intoxications; and (4) the psychoses. Such a classification is manifestly incomplete and imperfect. Thus many of the phenomena of groups (1) and (2) are interchangeable. It is moreover popular at the present time to attribute most of the physical ills to various toxæmias, either autogenous or heterogenous, and it is certain that no hard-and-fast line can be drawn clinically between certain maniacal states due to intoxication and those of a purely psychical etiology. In the present unsettled conditions of neutral pathology, to say nothing of psychological classification, the question of categories may be an academic one after all.

(1) Disorders of Sleep and Allied Phenomena.— (Dreams, Somnambulism, Trance, Lethargy, Catalepsy, Hypnotism, etc.). Under this category there are included a large number of closely allied phenomena, the most striking feature of which is a state originally termed by Janet dissociation of consciousness. In most of these phenomena the ordinary waking conscious state, with its refinements of judgment, inhibition, etc., is in temporary abeyance, naturally or artificially induced, and the patient dramatizes his unconscious fantasies. The meaning of these dramatizations may be evident or they may suffer from a number of psychical modifications, such as conversions, distortions, displacements, condensations, etc. (see article on Dreams), which mechanisms make it difficult or impossible to understand the meaning of the whole fantasy. Consult Hischmann, ‹Freud's Theories of the Neuroses, Nervous and Mental Disease, Monograph Series,› No. 17.

Somnambulism.— The simplest type of such fantasies is found in some somnambulistic states. In these the individual may perform, while still asleep, many of the simpler acts of the waking state, and indeed even many extremely complex acts are carried to completion. The patient awakes without any conscious recollection of the acts performed, and often such acts have been harmful to self and society.

The clinical phenomena are not constant. The eyes are frequently closed or semi-closed, or even wide open and staring. The pupils are apt to be sluggish in their reactions, but may be normal in diameter, dilated or contracted. The data collected by Gould and Pyle (‹Anomalies and Curiosities of Medicine›) may be referred to by those who would learn more of the complicated motor acts that many notable cases have been known to perform. Suicide and homicide have been committed by persons in the somnambulistic state. The somnambulistic state is recognized to be a special instance of autistic or fantasy thinking. The patient acts his unconscious fantasy, often with evident, but more often with complex and veiled, symbolisms. Association experiments and psychoanalysis seem to prove that the experiences lived during the somnambulistic state may be brought to consciousness. Some register is made in consciousness since a memory of them may be awakened. This does not mean that the individuals have a knowledge of what they were doing at the time it was done. This commonplace of medical science is one of the stumbling blocks of law, where the ignorance of lawyers has given rise to the stupid and unjust definition of "responsibility." Somnambulistic performances carry out the general trend of the unconscious, i.e., toward fulfilment of instinctive desires.

Nightmare.— This is a painful dream state. In many instances, where such are extremely distressing, they have been known to precede grave cerebral disturbance, but it is not certain that they have any close relationship with the same, save perhaps in certain types where the fear of death appears in symbolic form. The more recent studies of Freud, Jones and others have pointed the way to a better hypothesis of these nightmares. They are discussed more fully in the article on DREAMS.

Lethargy, Catalepsy, Trance.— These are terms used to describe atypical unconscious states which are as yet imperfectly classified, partly on account of the fugitive character of the alterations and partly because of the complications of the picture with other symptoms of the hysterical and epileptic conditions. The phenomenon of hypnotic sleep is best put in this category.

In catalepsy the prevailing phenomenon consists of the wax-like rigidity which the limbs can be made to assume, at times unconsciously; again, especially in the hypnotic condition, by the suggestion of the operator. In trance conditions there may be manifest a great variation of phases, most of which are accompaniments of the hysterical state. All of these phenomena which occur in a variety of the psychoneuroses as well as in the psychoses, cataleptic states, lethargies, trances, etc., being extremely frequent in hysteria and more particularly in catatonic types of schizophrenia (dementia præcox), have been much better understood, thanks to Freud's ingenious hypotheses. They all represent, as stated, wish-fulfilling fantasy dramatizations, the precise significance of which can be laid bare by the principles of psychoanalysis.

(2) **Disordered Conscious States in the Neuroses and Psychoneuroses.**— No sharp dividing line separates the neuroses from the psychoneuroses so far as the prevailing disturbances of consciousness are concerned. Here under the neuroses are considered neurasthenia and anxiety neuroses, while hysteria and the compulsion neuroses (morbid phobias, fears, compulsion ceremonials, etc.) are here termed psychoneuroses. For neurasthenia, the chief phenomena are fatigue state, anxiety states in the anxiety neuroses, conversions of psychical unconscious states into physical phenomena (blindness for not willing to see, deafness for not desiring to hear, paralysis from fantasies of various kinds, etc.); indeed the whole gamut of somatic signs of hysteria may be mentally reviewed by the reader as falling under the formula conversion. Finally in the compulsion neuroses there is an erection of psychical defenses which show the phenomena of substitution. Here the sources of the emotion in unconsciousness are transferred or displaced to some irrelevant matter which comes to symbolize in a specific manner the nature of the unconscious, suppressed emotional situation.

In many *neurasthenic states* organic factors loom large in determining the feelings of fatigue in consciousness. Others again, however, are purely emotional in their development and here conscious and unconscious processes are in rivalry. The desire to be sick to escape obligation; the reversion to indolence unconsciously is a large motive. The libido, that is, the energy of these individuals, concerns itself with their own bodies and they live, in fantasy, as neurasthenics, the life of the cared-for and nursed child. Here unconscious fantasy helps to disguise the task — that is, to be independent captains of their own destinies.

In the *anxiety neuroses*, physical states are also present, such as flutterings, tremblings, gaspings for breath, air hunger, very frequently palpitation, fear of impending death, anxiety lest something may happen to self, to others or to material welfare, diarrhœas, mucous colitis, gastric irregularities of all types, etc. These make up the physical signs induced by the unconscious fantasy, largely of temptation. These patients are constantly repressed; they suffer from suppressed excitement and the symptoms mentioned constitute the outlet for the repression, the exact nature of which is veiled behind the symptom, not as a true conversion as in the hysterical mechanism, save in certain mixed anxiety hysterias. Freud and Stekel as well as many others assume that this type of disorder is found more particularly in those who find the demands of culture too arduous, and yet whose ethical attitude refuses to face a certain, often but not invariably a sexual, situation. Unrequited affection, dissatisfaction with life's sternness, actual sexual stimulation without gratification — as in coitus interruptus, coitus reservatus, menopause, artificial and natural — unconscious temptations toward dishonesty, hateful impulses repressed from consciousness — these are among the dynamic factors bringing about these peculiar modifications of conduct to meet these situations.

In *hysterical conversions* the mechanisms are more complex. Here the complexes play a more determining rôle and the cast-off and yet still retained complex is more precise and definite.

Thus the essential factor, so far as consciousness is concerned, is dissociation which, according to the original view as held by Janet, is due to an inborn weakness, namely, some factor in the constitution of the individual which predisposed him to this type of reaction. Hence, by the French school, and by those who followed Janet's teachings, the search for this inborn factor was made chiefly in the prenatal life of the individual, namely in heredity, and unfortunately as a correlate of such teachings a pessimistic attitude toward therapy was inevitable. The chief advance made in the hypothesis formulated by Freud was that the factor bringing about dissociation was not so much to be sought in heredity as to be looked for in the psychological dynamics of the nervous system, so that, for reasons which psychoanalysis has revealed, a certain group of ideas or complexes remained in the unconscious, but were still active. Hence arose the concept of repression as worked out by Freud.

Inasmuch, however, as the dynamics of the nervous system could not be interfered with, some form of expression of energy must take place. The repression acting upon this discharge of energy brings about the process of conversion, that is, there is a motor discharge but the repression distorts it — puts a different face upon it, so that the patient carries out the unconscious repressed wish in a form of dramatization known as the symptoms of the disease.

This dramatization, concerning which a much more extended discussion will be found in the article on HYSTERIA, presents a number of distorted mechanisms which a study of the dream life has made clear. These distorting mechanisms permit the living out of the wish, at the same time that it remains practically unconscious. Mixtures of conscious and unconscious fantasy are present in practically all hysterical attacks, so that they present various combinations.

The symbolism of the attack itself may represent a number of things. Thus, among the commoner forms of dramatization one finds that:

1. The hysterical symptom is the memory symbol of certain actual traumatic impressions and experiences.
2. The hysterical symptom is a substitute created by conversion for the associative returns of these traumatic experiences.
3. The hysterical symptom is like other psychic formations, the expression of a wish fulfilment.
4. The hysterical symptom is the realization of an unconscious fantasy, which serves a wish fulfilment.
5. The hysterical symptom serves to represent a sexual gratification, and represents a part of the sexual life of the patient.
6. The hysterical symptom corresponds to a return to a kind of sexual gratification which was real in infantile life, but which has since been repressed.
7. The hysterical symptom arises from a compromise between two opposed affective and instinctive impulses by which the one brings a partial instinct or component of the sexual repression to expression, the other seeks to suppress the same.
8. The hysterical symptom can become the representation of different unconscious nonsexual impulses, which cannot, however, be without a sexual meaning.
9. An hysterical symptom is the expression on the one hand of a masculine, on the other of a feminine, unconscious sexual fantasy.

These represent the more easily recognized interpretative formulæ of an hysterical attack, number 7 being the most frequent.

The chief interest, however, in interpreting this pantomime resides in the close similarity which it presents to the pantomimes of dreams and myths, and of fairy tales. We thus see that the misleading, incomprehensive and indistinct outlines of the attack consist:

1. In a combination of several simultaneous fantasies, for example, a recent wish and a revival of an infantile repression.
2. In a multiple identification when the patient undertakes to carry out the activities of both persons appearing in the fantasy.
3. In the antagonistic conversion of motor innervation so that a negativistic expression is to be interpreted in the light of its opposite.
4. In an inversion of the time sequences; this complicates the picture, just as an inversion in the motor character of the phenomenon and an hysterical attack may begin backward and work forward, just as a cinematograph film may be displayed running backward.

In hysterical dream states the unconscious activities may be readily understood by one who is capable of understanding the pantomime. The patient plays the part with unerring accuracy.

Compulsion Neuroses.— Here the unconscious factors are handled in a manner somewhat different from that seen in hysteria. Under this head is usually included a large number of obsessive, phobic and compulsive ideas which represent an unsuccessful repression of the psychosexual conflict. Unlike hysteria, the conflict is apt to come into consciousness; it cannot be entirely disguised by the distorting mechanisms. Conversion is not so frequent a phenomenon, but instead another type of reaction is met with, namely, substitution. By this is meant that the repressed conflict, breaking into consciousness, does not come into consciousness in its true light, but is immediately transferred or transposed, that is, substituted, upon something that is innocuous. A common illustration from every-day life illustrates in part this mechanism. Thus, an irritable husband with a burden to carry, immediately on sitting down to breakfast, complains about the coffee; notwithstanding the fact that the coffee may be the same that he has been drinking for 15 years, on this particular morning it is atrocious. Here the psychical disturbance, the discomfort, the irritability is transposed or substituted upon the innocuous object, and one that has nothing whatever to do with the original source of irritation, but serves as a carrier or outlet for it. Thus the phobia, the compulsive act, the obsession becomes the innocent object for the expression of the emotional or complex disturbance of the patient. Thus, a patient will be unable to look upon a negro, will refuse to go out of the house without securing the door a number of times, or may have to put white papers under the beds, or in dark closets, have to look at people two or three times to be persuaded that they are not negroes, and a complicated ceremonial grows up about the question. The negro is only a symbol and behind the symbol lies the original difficulty.

To understand the activities of the unconscious in the compulsion neuroses is very difficult, but perhaps the most illuminating hypothesis that has been utilized for the explanation of these phenomena is that of Freud. He assumes that the fairly developed neurosis, say of a person of from 25 to 35, or even 40 years of age, represents the terminal stage of a complicated series of phenomena. The initial stage is usually laid down in childhood where, as a reaction to infantile attitudes, usually of a nature to satisfy sexual curiosity, then not known to be sexual, the patient comes to a sense of guilt concerning these activities. This sense of guilt is usually overcompensated for by little manifestations as it were of overgoodness. The children become very punctilious, very fond of their parents, intensely religious or intensely self-sacrificing, do everything they can to be good, which is hardly the normal state of childhood. They are compensating for something which needs to be compensated for apparently, and the compensation aids in pressing memories of the early experiences or fantasies into unconsciousness. It may be that this overcompensation is effective, as it frequently is in mystics, religious enthusiasts, zealots, reformers, extremists and cranks of various kinds, but not infrequently the overcompensation breaks down, the original fantasies which have been put to sleep reawaken now with a much stronger imperativeness, and immediately a conflict arises, whereby the demands of the original instincts of gratification can be accomplished, and also whereby the demands of a cultural attitude may be maintained. A ceremonial which represents these conflicting tendencies develops whereby the patient can keep his cake and eat it too. The mask that is worn is of various types, as any one who has had a large experience with compulsion neuroses can testify. Sometimes an overdetermined symbolism may in the course of time become extremely complicated. The patient is driven from one level to another, and in the search for rest lights upon a series of islands of safety as it were, to be away and have to search for a new one. Thus successive lines of defenses grow up, and in every old compulsion neurosis the unraveling of the various lines of defense becomes an extremely difficult matter. It is highly probable that no compulsion neurosis can be analyzed within six or eight months, and some cases take one or two years. They constitute the hardest problems in the treatment of the psychoneuroses.

Intoxications.— An adequate discussion of the disturbances of consciousness in the intoxications would require a large volume. Those resulting from the action of alcohol alone would require a monograph. The study of the influence of alcohol upon consciousness is one of intense interest, since in increasing dosage one can observe, along the retrograde path, the whole phylogenetic and ontogenetic development of consciousness. In comparatively small doses the conscious development of higher culture may be peeled off, then those of less advanced grades disappear; an individual man may in successive layers be shown through all of his psychical stages of development. At the vital level he represents the spinal animal, still feeling and living, but reflex orientation may be preserved. Consciousness is here reduced to unconsciousness and all of the reactions of the anencephalous monster may be preserved. Finally passing below vital levels alcohol reduces the human animal to a physico-chemical apparatus, in which the only functioning parts are the sympathetic metameres. Here unconsciousness is at its lowest level, if unconsciousness one wishes to call it, for here mere tropisms show themselves. The lungs continue their oxygen exchange, the kidneys their chemical filtration and all other organs of the body carry out their physical chemical functions, but lacking all co-ordination, all interrelationship. Every cell is looking out for itself independently one of the other, anarchy and chaos rule, and only the vagus preserves its activity in respiration and in the heart beat. Here are bits of primordial protoplasm which started the evolutionary series. Everything that man is or ever has been may be reached by the alcohol path, and as is well known it chiefly is the "has beens" that are acquired.

Psychoses.— Here disturbances of consciousness are most varied. It is practically impossible in the present state of our knowledge to apply the scheme of our stages of evolution to them. Certain psychoses reduce the individual to the physico-chemical level, such for instance as paresis, senile decay, even certain stages of dementia præcox drop to this level. The intoxication and infectious psychoses, those associated with disintegration and degeneration of brain tissues, also show the same results. Other psychoses only bring man down to his vital levels, return him to the animistic stages of development, whereas others again only involve him in his higher psychical sphere. Here symbolism becomes affected, and although the patient may not come in conflict with his surroundings, nevertheless he is out of touch with certain types of reality. No consistent applications of the hypothesis can as yet be made to the psychoses without a much more extended discussion.

SMITH ELY JELLIFFE.

CONSCIOUSNESS IN ANIMALS. See MIND IN ANIMALS.

CONSCRIPTION, the enlisting of men for military service by a compulsory levy, at the pleasure of the government. It is distinguished from recruiting, or voluntary enlistment. Conscription was enforced in the states of ancient Greece, most especially in Sparta. The name is derived from the Roman military constitution. Every Roman citizen was obliged to serve as a soldier from his 17th to his 45th year; the consuls announced every year by a herald or written order that a levy was to be made (*milites cogere colligere, scribere conscribere*); and all citizens capable of bearing arms assembled in the Campus Martius or near the capitol, where the consuls assisted by the legionary tribunes made the levy, choosing as many men as were needed from each tribe. The renascence of conscription in the form of a scheme of universal service embracing the greater part of the population dates from the French Revolution. The combination of volunteers and conscripts which constituted the army prior to 1792 was replaced by a purely conscriptive scheme. However, as the administration of this scheme was left in the hands of the local authorities, the army soon became filled with vagabonds and criminals. After 1796 the revulsion against war led to a considerable opposition to conscription. In 1798 the famous conscription law of Jourdan was enacted, which made all male citizens between the ages of 20 and 25 liable to a call to the colors. A most vicious clause in this law, which remained in force until 1870, and may fairly be charged with contribution to the loss of the Franco-Prussian War, was that which permitted the buying of exemption.

The German system of conscription dates from the degradation of Prussia after Jena. The treaty of peace, which forbade the maintenance of a large standing army, compelled Prussia to turn her army into a vast training-school, whereby at a small expense and without violating her treaty agreements a vast reserve was built up from the many quotas that underwent a brief period of service with the colors. This system is now the basis of the military organization of the whole continent of Europe, and of Japan. It consists in compulsory service with the colors for a short period, a long period in the various reserves and few exemptions. Switzerland (q.v.) is unique among the Continental nations in replacing the service with the colors by a few weeks' training each year.

Until the beginning of the European War, England and America were the only two countries which relied exclusively on the voluntary system. In England the voluntary system was attacked by Lord Roberts, but defended by Lord Haldane and Sir Ian Hamilton, on the grounds that the volunteer, especially the trained volunteer which the British long period of service furnished, was proportionally so much a better soldier for such remote and difficult wars as those into which Great Britain was likely to enter as to counterbalance his relative fewness in numbers. Meanwhile, Australia had the distinction of being the first English speaking nation to initiate a limited compulsory military training and service. Until January 1916 England retained the scheme of voluntary service, but with a continually increasing moral pressure from unofficial and official sources on those who did not enlist. In the autumn of 1915 Lord Derby devised a system whereby it was possible for a man to enroll himself for military service so that he would be called up when he was needed. Soon afterward certain restrictions were adopted prohibiting the emigration of unmarried men. These restrictions obviously had in view the ultimate adoption of compulsory service. This was enacted in a bill introduced by Mr. Asquith, the Prime Minister, on 4 Jan. 1916. The Derby scheme remained in effect until 2 March, when conscription came into force. The conscription scheme adopted is unique in exempting from armed service (not from all service whatever) those who have conscientious objections to warfare. The sincerity of their objection, however, is subjected to a rigorous examination. Ireland was excluded from the provisions of the act. See War, European.

Immediately upon entering into the European War America adopted conscription. (For the details of the scheme adopted, and for the practice of conscription in the War of the Rebellion, see Drafts). Canada also initiated conscription in 1918, but at the present time (March 1918), it appears that Australia, which had conscription for home service long before the War, is unlikely to adopt conscription for foreign service. It has been put to a vote, and has been rejected. The policy of England, the United States and Canada toward conscription in time of peace is as yet indeterminate. (For the organization of the conscript armies of the world, see Army; Army Organization). Consult Beyerlein, F. A., 'Jena oder Sedan' (1903); Chevrillon, A., 'England and the War' (London 1917); Hamilton, Sir Ian, 'Compulsory Service' (London 1911); Lord Roberts, 'Fallacies and Facts' (London 1911).

CONSCRIT DE 1813, Histoire d'un (History of a Conscript of 1813), a famous story, by Erckmann-Chatrian, published 1868–70. The narrative turns mainly on the contrast between the perpetual mourning that is going on in families and the perpetual Te Deums for disastrous victories. This is the dominant note; and in the mouth of the humble conscript, this thesis, interpreted by scenes of daily carnage, is more eloquent and persuasive than if it borrowed arguments from history or philosophy. The style is simple, familiar; but never trivial or commonplace, and is always in harmony with the speaker. As the work was hostile to the Napoleonic legend, numerous obstacles were put in the way of its circulation at the time of publication. But notwithstanding, it was scattered in profusion throughout France by means of cheap illustrated editions.

CONSECRATION, an act by which material things and persons are dedicated to sacred uses and sacred ministries. Celebrations of rites of consecration are traced back to the earliest historic periods of Assyrian, Chaldaic, Egyptian and Hebraic civilizations. The word Consecration is also used in the Roman Catholic ritual and liturgy to signify the act of Transubstantiation (q.v.) by which the bread and wine are in the Mass changed into the body and blood of Christ. In the Roman *Pontificale* or ritual for episcopal functions there is a form for consecration of a bishop, consecration of a church, consecration of the sacred vessels used in the liturgy of the Church. In the consecration of a bishop — ordinarily performed by the metropolitan and two other bishops — the consecrating bishops impose hands on the bishop-elect and the metropolitan delivers to him the pastoral staff and the ring, emblems of his office, and anoints him with chrism, the sacramental mixture of olive oil and balsam, pronouncing the formula of words by which is expressed the commission of authority to rule the Church committed to his charge. The consecration of a church is a very elaborate ceremony, requiring several hours to complete it: there is chanting of the office of Matins and Lauds by the clergy; there are processions of clergy, headed by the consecrating bishop and other bishops who may be present, around the walls outside and thrice around the interior, with continuous chanting of psalms; there is anointing of the doors, of the walls, of the high altar; and a number of other rites. The consecration of the vessels destined for the service of the altar is also an episcopal function: it is a rite that has descended from high Christian antiquity: in this rite also chrism is employed.

CONSENT (OF. *consente,* Lat. *consentire,* "to agree"), *in law,* a free and deliberate act of a rational being. Any voluntary act by which the agent takes away his own power of giving a deliberate consent, such as partial intoxication, will not invalidate the consent; but it is invalidated by any undue means — intimidation, improper influence or imposition — used to obtain it. The law does not, in general, take cognizance of the wisdom or folly of men in entering into contracts before it enforces them; but where clear proof can be brought that a person has been wilfully misled or entrapped into a contract, it will refuse to enforce it. In pathology consent signifies an agreement or sympathy in virtue of which one affected part of the system affects another part or parts.

CONSEQUENT STREAM. On a newly emerged portion of the sea bottom, forming a coastal plain sloping toward the ocean, the run-off from rainfall gathers into little rivulets that flow down the slope to the sea. These channels enlarge till finally the water courses constitute true rivers. Streams like this, whose course is determined as a consequence of the initial slope of the land, are called consequent streams. See also SUBSEQUENT STREAM.

CONSEQUENTIAL DAMAGES OR LOSSES, *in law,* are losses incurred in consequence of an act, but not flowing directly from it. The liability for consequential damages resulting even from an unlawful act is more limited than that for direct damages, as it is evident that the power of the law in tracing and enforcing such damages must be limited; but in some cases they can be enforced.

CONSERVATION OF ENERGY. See ENERGETICS.

CONSERVATION OF MATTER. See MATTER.

CONSERVATION OF NATURAL RESOURCES. The conservation movement, first clearly started in the United States in 1908, aims to protect and to develop the fullest permanent usefulness of the great national resources — forests, lands, minerals and waters — whose use has heretofore been accompanied by such great waste. Its chief principles are that the resources shall not be wasted, that the national resources shall be administered by the national government and that both public and private resources shall be administered with some reference to the interests of future generations. The movement is also part of a general effort to prevent the private monopoly of valuable resources. Its chief purpose is to secure by intelligent direction a wise and careful use of national resources, but not to withhold them from necessary use. In the case of some resources (as timber) its problem is to provide for renewal as used; in the case of others (as minerals) its problem is to secure more careful use or substitutes, and prevention of waste.

The American people, bred to carelessness and drifting policy, in the midst of plenty, became known for their wastefulness. In the long period of the settlement of new lands, the natural resources, regarded as practically unlimited, were exploited with prodigal waste. The pioneers claimed the right to occupy and the right to exterminate whatever stood in the way of occupation. They destroyed valuable timber, wild game and fur-bearing animals. They would have exhausted the fishing grounds but for the work of the State and national fish commissions. Great lumber companies used commercial methods which proved even more destructive than the acts of the pioneer. Fires, both from heedless and intentional sources, were frequently more destructive than the wasteful methods of lumbering. Deforestation, resulting from American reckless policy, brought indirect losses even more serious than the direct loss of timber — the losses from erosion and serious depletion of soil, irregularity of stream-flow, flood and landslides. Unrestricted by national regulations, the cattle barons, by a system of wasteful exploitation, ruthlessly and rapidly exhausted the public pasture land of the great watershed between the Mississippi and the Rockies. The sheepherders followed and completed the work of depletion, precipitating disputes with the cattle men over the public range to which neither had a legal title. The pioneer farmers by reckless exploitation and unscientific methods exhausted the farm lands. The pioneer exploiters of coal mines exhausted the mineral resources by criminal waste. The pioneer oil men wantonly destroyed natural gas. The same heedless waste characterized the early stages of exploitation in the mining of precious metals. The captains of industry were no less ruthless in the exploitation of the energy of human beings in factories, foundries and mines, and in railway service, by methods which contributed to the general industrial waste.

Americans, who until the close of the 19th century still exulted in the strength of their limitless resources, in the first decade of the 20th century began to regard the protection of the rights of the people in the public domain as more important than the immediate exploitation of its wealth, and began to favor public control and legislative limitations on private enterprise as essential to industrial liberty and the general welfare. Fearing the exhaustion of their natural resources, they expressed their fear in a well-developed movement for conservation. They urged more careful attention to the soil with a view to restoration of fertility by scientific farming. They favored government projects for extension of irrigation begun by private enterprise. They sought to find plants and methods which would bring crops to semi-arid areas and unirrigated deserts. They sought through national and State governments and great corporations to establish forest reserves to prevent exhaustion of timber and to prevent alternate floods and droughts, and encouraged scientific study of forest problems. They began an agitation to prevent waste of supplies of coal and iron, and to save coal supply, by urging the importance of the preservation and development of latent water power to produce electricity. They were awakening to the fact that power sites should be leased, not sold or given away, and that privileges of using this natural source of wealth should be granted on terms conserving the rights of the public to adequate service at a reasonable charge. They lessened the demands on forest and iron ore by use of cement as a substitute for wood and iron. Finding that a large amount of the resources upon which the future must depend were held by a comparatively few individuals or corporations, they began to demand that the unappropriated resources should be administered primarily for the benefit of the public, and that those already in private hands should be subject to government control. They began to urge selection of trained experts to study the economic utilization of resources, and co-operation to regulate the life of the community for the good of all.

With changes of conditions which brought a realization of dangers from waste, the need of a national policy of conservation arose. A rise of prices of raw materials in connection with every resource is probably the strongest economic force leading to more scientific utilization, and this is the strongest guarantee of conservation, but legislation is also needed.

The Roosevelt administration first saw the importance of a more active national control of natural resources for the benefit of the public. In February 1907, calling attention to the waste of mineral resources, the President recommended legislation for separation of the title to the surface of the land from the title to the underlying mineral fuels, in order that the latter at least might be withheld from monopolizing or speculative private interests and kept for the public benefit. He considered that "the conservation of our natural resources and their proper use constitute the fundamental problem which underlies almost every other problem of our national life." Early in 1907 he took the first practical step toward the solution of the problem by the appointment of the Inland Waterways Commission to investigate and recommend a full and comprehensive plan for the development and utility of the water resources of the country. In May 1908 he took the second step in calling at the White House a conference of governors to which facts regarding natural resources were presented by experts and at which plans for conservation were considered. This conference began a definite movement for conservation. Following its first meeting the President took an additional step by the appointment of a National Conservation Commission composed of about 50 members under the chairmanship of Gifford Pinchot who was head of the forestry division. This commission made the first national inventory of natural resources, published in 1909. It directed attention to the waste in extraction and treatment of mineral products, the decrease of soil fertility, the extinction of wild game and fur-bearing animals, the decrease of forests by timber industries and by fires, the waste of water in public and private irrigation projects and the great losses by failure to utilize the power of water flowing over government dams.

Disclosures of recent government investigations thus begun are appalling. Experts report that many natural resources are rapidly nearing exhaustion; that at the present rate of consumption and with present wasteful methods the timber can last only 30 or 40 years, that the supplies of available coal can be expected to last only 150 years, and the supply of petroleum only 50 years, that the supply of high grade iron can last only 100 years and the known copper deposits only 50 to 100 years.

Advocates of the new policy proposed not only to conserve by more economic methods of extraction but also by substitutes to reduce the consumption. The storage and properly directed release of vast water power which has remained uncontrolled and unused can be made to save other resources from damage and at the same time to conserve enormous supplies of coal. By complete utilization of this neglected resource, floods may be reduced, better means for irrigation provided, waterways improved for navigation, and larger power secured for industrial purposes.

President Roosevelt withdrew large areas of western public land from sale and settlement for the purpose of investigating their resources, and recommended legislation for protection of the interests of the general public in their forests, minerals and water powers. Important steps toward a national policy were taken by the creation of national forests (under acts of 1891 and 1907) and the Forest Service. The latter is a bureau of the Department of Agriculture which successfully protects and administers the public interests in the national forests, which contain one-fifth of all the standing timber in the United States, protect the headwaters of every western river and aid in supporting half the sheep in the western ranges. It also co-operates with State bureaus. It protects the forests from fire and depredations, improves the conditions for timber growth, protects the water supply and utilizes the forage crop. Besides the practice of scientific forestry it conducts investigations and collects much useful information for dissemination. The new policy defeated the attempts to cede the national forests and the entire public domain to the Western States which cannot so well administer them in the interests of the whole people.

In the Far West a decided opposition arose against the new forest policy, but by 1911 the policy of Congress not to release any of the safeguards against the forestalling of land by corporations and large individual owners and to continue the forest policy and to reserve public mineral rights became clear.

In 1911–12 Congress began appropriations for the purchase of forest reserves in the Appalachian and White mountains.

In 1909, the first steps were taken to prevent plans of great capitalists to obtain control of valuable natural resources in Alaska. Ex-President Roosevelt led in the support of a plan of government ownership with leases to corporations.

The conservation policy was also manifested in the agitation to reserve water-power sites, to secure new laws for the disposal of coal lands and to modify the Homestead Act. By act of 1910, the President can reserve public lands for water-power sites or irrigation. The Secretary of the Interior recommended that the Federal government be authorized to lease such power sites at a moderate rate for a period of not to exceed 30 years. It has been urged that the development of power in navigable and source streams should be co-ordinated to reduce drain on other resources, to aid in the control of streams for navigation, to prevent soil wash and to purify water supply. For the proper conservation of water power the most important thing is to prevent private monopolies from getting the sites and to preserve the use of them for the benefit of the whole people. The importance of this is indicated by the fact that 65 per cent of all the developed water power of the United States was controlled by 10 groups of power interests, several of which were closely related by interlocking directorates. The new policy of national conservation defeated the latest selfish attempt of organized power interests to obtain in perpetuity and for nothing the unregulated control of water powers of navigable streams in the national forests and on the public domain.

Recently the Federal government has begun active participation in the reclamation of arid lands by irrigation projects which were first begun by private corporations as early as 1880. The national irrigation policy emerged from disputes of western farmers with the large private water companies which by 1900 had secured and developed the best irrigation sites, and also from the necessity of protecting rivers and lakes from which irrigating waters were drawn. The Federal government has encouraged irrigation by the desert land laws of 1877 and 1891, by the later Carey act of 1895 (modified in 1901 and 1908), and by the more important Newlands reclamation act of 1902, by which the government began to reserve from settlement many areas of water supply and could hold the mountain streams necessary to fill reservoirs and use the water drained from the dams. Congress advanced $20,000,000 for the construction of irrigation dams to be satisfied from the proceeds of the sales of the improved land.

Congress has gone far toward committing the government to the policy of control by authorizing the President to withdraw public lands from private use whenever important for conservation of forest or grazing lands, water power, irrigation possibilities or scenic beauty, but has not yet determined the terms on which mining and development rights will be conceded. Little effort has been made to protect mineral resources from waste or improper exploitation. In 1900, Congress enacted a law authorizing the President to withdraw temporarily from settlement and sale and to reserve for public purposes any lands in the United States and Alaska or to reserve as government property the coal and other minerals beneath the surface. The National Conservation Commission advocated the disposal of coal lands only under leases safeguarding the interests of both the mining investor and the public. Steps were taken to withhold from private ownership the coal deposits in Alaska, and the government undertook the construction of a railway leading to the Matauska coal field. This is the beginning of a new system in line with the example of many European countries.

Another illustration of the new policy of conservation is found in the guarding of the north Pacific seal fisheries by an international agreement of 1896 between the United States, Great Britain and Russia, and by a later treaty of 1911 in which Japan joined.

To make resources safe from waste and unregulated monopoly, the advocates of conservation still urge legislation for the development of water power of the national forests and other public lands on terms fair both to the people and to the power interests, for improvement of public grazing lands by regulated use, for preventing by adequate penalties the needless pollution of streams, and for the utilization of the resources of Alaska for the benefit of the people.

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James M. Callahan,
Professor of History and Political Science, West Virginia University.

CONSERVATIVE, as applied to one of the two great parties in English politics, was first used by J. W. Croker in an article in the *Quarterly Review* for January 1830, and was by Macaulay, in the *Edinburgh Review* for 1832, referred to as a "new cant word." Conservative accordingly began to supersede Tory about the time of the Reform Bill controversies. The plural form of the word, or its equivalent in other tongues, has been assumed as a distinctive name by certain political parties in many nations. These parties are sometimes actually, and always avowedly, opposed to changes from old and established forms and practices. In United States history these names have never been in general use, but in Van Buren's administration the name of Conservatives was applied to those Democrats that at the special session of Congress of September 1837 opposed the establishment of the sub-treasury system. In the Congress that met in December 1839 they had practically disappeared. The name was also assumed by Southern whites during the reconstruction period following the Civil War, to show their adherence to the old State governments, the abolition of which by Congress they opposed. In Virginia the name was in use until 1872. The name was also used in the North during this period. The Democrats applied it to themselves to draw moderate Republican votes. In the United States (1830–40) the name of Conservatives was adopted by seceding Democrats, 4 in the Senate and 14 in the House, who voted with the Whigs against the sub-treasury, though voting with their party on other questions. They called themselves Conservatives, as wishing to conserve the prosperity of the State banks, which they held the sub-treasury to be a disguised attempt to ruin. They held the balance of power in the House 1837–38, and voted down in two successive sessions Silas Wright's sub-treasury bill, which had been passed by the Senate. The elections of 1838, however, returned only four of them to the House, and these ceased their active opposition — partly because the government had only escaped bankruptcy in 1838, on account of uncollectible claims against banks and individuals, by issuing fresh treasury notes in place of those canceled. The Whigs held the power and passed the Wright bill in 1840. In the Civil War the Northern Democrats, and especially the border State Democrats, often called themselves Conservatives, as wishing to preserve the old balance of State and national powers; and the name was much ridiculed by the other side. During the Reconstruction period, the Southern whites to a considerable extent took the name of Conservatives as wishing to preserve their old State governments, which they held to have the same existence and sovereignty as before the war, according to the declarations of the Northern leaders and Congress themselves, in stating the purposes of the war. The name, more particularly in Virginia, lasted down to 1872. See Tory; Whig.

CONSHOHOCKEN, Pa., town of Montgomery County, on the Schuylkill River and Canal, 13 miles northwest of Philadelphia, and on the Pennsylvania and the Philadelphia and Reading railroads. It has a number of manufacturing interests, including blast furnaces, rolling-mills, woolen- and cotton-mills and pottery works, rubber works, surgical-implement works, the principal products of which form the basis of an extensive trade. Conshohocken was founded in 1830 and was incorporated as a borough in 1852. Pop. 7,480.

CONSIDÉRANT, kôn-sē-dā-rāṅ, **Victor-Prosper,** French Socialist: b. Salins, 12 Oct.

1808; d. 27 Dec. 1893. After being educated at the Polytechnic School of Paris, he entered the army, which, however, he soon left to promulgate the doctrines of the Socialist Fourier. On the death of his master (1837), Considérant became the head of his school, and undertook the management of the *Phalange,* a review devoted to the spread of their opinions. Having gained the support of a young Englishman, Mr. Young, who advanced the money, Considérant established, on a large estate in the department Eure et Loire, a Socialist colony or *phalanstère,* but the experiment failed, and with it the *Phalange* fell to the ground. Thereafter he continued to promote his views in the *Democratie Pacifique.* Among his numerous writings, the chief is the 'Destinée sociale,' dedicated to Louis Philippe, which contained little more than a review of the principles of Fourier. In 1849 Considérant as a member of the Constituent Assembly was accused of high treason and compelled to flee from France. Near San Antonio, Tex., he founded a Socialist community, *La Réunion,* which flourished for a time, but afterward came to nothing and he returned to France in 1869. Of his works, the one which has the greatest claim to originality is his 'Socialisme devant le vieux monde' (1849). In religion Considérant was a conservative; and was also opposed to the Revolution.

CONSIDERATION, a legal term covering the principle governing contracts and signifying something in the way of price or compensation which may be of value to the contractor or of detriment to the contractee. In law no contract is valid if it does not expressly stipulate the amount or consideration for which any lease, sale or transfer is made. As there are various kinds of contracts recognized in law, so are there different sorts of considerations. The simplest case is that where one party surrenders some property right to another for a consideration. In dual contracts the promises are mutual — each promising a consideration to the other. But whatever the nature of the contracts — and they grow in complexity from day to day — no legal action can be taken upon them unless the consideration is clearly specified therein. But considerations need not always involve direct benefits to the contracting parties. Promises made *after* services rendered cannot become the basis of legal action, because such services are not rendered *in view* of a consideration. Thus, promising a reward after being saved from drowning, for instance, does not make one liable. Nor are promises binding when they involve the performance of what is one's legal duty, anyhow. No promise is legal which involves the performance of an illegal act. The adequacy or inadequacy of a consideration, however great or small, never matters in law. Thus, one may legally transfer property rights worth thousands of dollars in consideration of one cent.

The history of the law of contracts, could it be entered into here, would show the origin of the requirement of consideration. It clearly grew out of the original custom of requiring proof of damage or detriment suffered by the plaintiff seeking pecuniary consideration. Consideration as applied to a court, in legal phraseology, means the judgment of the court, "it is considered by the court" being equivalent to "it is adjudged by the court." See CONTRACT.

CONSIGNMENT, in law, the act of sending goods, as to an agent, for sale; also, the goods so sent. The one who sends the goods is known as the consignor, and the one to whom they are sent is known as the consignee. Usually when a consignment is sent by common carrier a bill of lading is given which serves as a receipt and contract of shipment.

CONSISTORY, in ecclesiastical usage, means a court or council of ministers and Church officials or dignitaries, for transaction of business relating to the Church. In the Roman Catholic Church the Consistory by eminence is the whole college of the cardinals, which is, so to speak, the Pope's senate, assembled at stated or occasional times to deliberate questions of Church administration. It is usually presided over by the Pope in person, but often by his delegate; the stated meetings are twice a month; the sessions are secret usually and the meeting is merely formal, but often they are public when the cause of the meeting is the conferring of the hat on newly created cardinals; or semi-public, Church dignitaries of rank inferior to the cardinalate being admitted, the purpose of the meeting being to discuss a canonization. In the Church of England every bishop of a diocese has a consistorial court for determination of ecclesiastical causes arising within his jurisdiction.

CONSOLACIÓN DEL SUR, kōn-sō-lä-thē-ōn' děl soor, Cuba, the name of a district and a city in the eastern central part in Pinar del Rio province. It has railroad communication with Havana. Pop. of the district about 17,000; of the city 3,062.

CONSOLATO DEL MARE, kŏn-sō-lä'tō děl mä'rě, a compilation of sea laws. See COMMERCIAL LAW.

CONSOLIDATION OF SCHOOLS, the term used when two or more rural school districts are made into one district, one school in one building replacing two or more small schools in several buildings. In most districts this includes the transportation of pupils to the school at the public expense, either in special vehicles provided by the school, or in private vehicles, the expense being paid by the school. The primary motive is to secure better educational advantages for the pupils of the rural districts. The district schools have been pitifully inadequate because their number made necessary small salaries, and therefore poor teachers and poor equipment. The plan of the consolidated school is, in brief, as follows: two, three, four or five existing school districts, each maintaining small, inefficient rural schools, vote to unite their schools, or are consolidated by some central authority. A three- or four-room schoolhouse, built on modern lines, well ventilated and heated is erected at some central location. Arrangements are made for the transportation of all of those students living at a distance. The school is organized under a principal, and often several consolidated schools unite in employing a supervising principal and teachers in special branches. The stimulus has been great enough in many cases to instigate the formation of a high school, grade school and a specialized teaching staff. This plan of union is not possible in mountainous or sparsely populated districts. The advantages are numerous, although at first the Middle Western States which are now the strongest supporters of the plan objected strenuously. The first improvement is to be found in the better teachers and the greater interest shown on the part of the teacher and pupil. Secondly the opportunity for the country boy or girl is made equal to that of the city pupil, on account of the increased curriculum, the better organization and instruction and the other activities opened up for the country child. A third advantage is the cheaper cost. The effect on the neighborhood has been to increase interest and pride in the school and the stimulating of effort to provide better trustees, teachers and equipment. The objections, that the consolidated school is impractical, burdensome to the children, and depreciates value of the property near which the school formerly stood, have been removed slowly by experience, and the consolidated school has become a well-recognized institution both in the United States and Canada.

The movement began in New York State in 1853, when an act was passed permitting consolidation, known as the Union School Law, incorporated as Title IX of the Consolidated Act of 1864. Massachusetts followed next, and the movement spread rapidly. The North Central States have made excellent progress in consolidation; and nearly every State has some provision for union schools.

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CONSOLS, or **CONSOLIDATED ANNUITIES,** a public stock forming the greater portion of the national debt of Great Britain. It was formed in 1757 by an act consolidating several separate stocks bearing interest at 3 per cent into one general stock. At the period when the consolidation took place, the principal of the funds united amounted to $45,689,105; but through the addition of other loans it has increased so much that now, after considerable reductions, it still amounts to more than half of the national debt, which in 1914 reached the enormous sum of $3,443,799,000.

CONSONANCE. See CONCORD.

CONSONANT. See ALPHABET.

CONSORT, he, she or that which shares the same lot with another; a companion; a partner; an intimate associate; a wife or husband; applied in a modern sense chiefly to persons of royal degree or position, in countries where women are able to reign; as a queen consort; a prince consort; that is, the wife of a reigning monarch, or spouse of a queen-regnant. It is also applied to a ship sailing in company with another.

The queen consort, the wife of the reigning king, is, in all legal proceedings, looked upon as a single, not as a married woman. She may purchase and convey lands, grant leases and do other acts of ownership without the intervention of the king. She may also sue and be sued in her separate person, and possesses courts and officers distinct from those of the king. She pays no toll, and is free from any fine which a court could impose upon women in general; but in other respects she is on a similar footing with the other subjects of the king. In her life and person, however, she enjoys the same protection as the king, it being high treason to design the death of either. The husband of a queen-regnant is not endowed by the constitution with any distinctive rights or privileges. All his privileges and honors, therefore, must emanate from the Crown, under the form of a warrant, grant or patent, or else be conferred by act of Parliament introduced after a royal message on the subject. Up to 1857, when the title of Prince Consort was bestowed upon him by letters patent, the late Prince Albert possessed no distinctive title and no place in court ceremonial but such as was accorded to him by courtesy. An opposite instance was that of Ferdinand of Aragon, who, on his marriage to Isabella of Castile, became joint ruler of that country.

CONSPIRACY, legally defined, “a combination by two or more persons, by some concerted action, to accomplish an unlawful purpose, or to accomplish a purpose not in itself unlawful, by unlawful means.” Some of the more important common law conspiracies were those to commit treason or sedition, to murder, to cheat and defraud and to injure another maliciously. The common law recognizes as an offense the agreement between the conspirators to do an unlawful act, and no overt act is necessary for the completion of the crime. Changes have been made in this holding of the common law by the laws of several of the States and by Federal legislation in the United States. Where the changes have been made it has been declared that an overt act was necessary to make the conspiracy a crime. Conspiracies are ranked as misdemeanors, except such as by acts of legislation have been declared statutory conspiracies, and punishable as such, and they are ranked as felonies. Consult Bishop, ‘New Commentaries on the Criminal Law’ (Boston 1900); id., ‘Commentaries on the Non-Contract Law’ (Chicago 1889); also ‘Encyclopedia of the Laws of England’ (2d ed., London 1907).

CONSTABLE, Archibald, Scottish publisher: b. Carnee, Fifeshire, 24 Feb. 1774; d. Edinburgh, 21 July 1827. He was the original publisher of the *Edinburgh Review,* the poems of Sir Walter Scott, the ‘Waverley Novels,’ and other well-known works. In 1826, however, the firm was compelled to stop payment, with liabilities exceeding $1,250,000. Sir Walter Scott, who was heavily involved, practically sacrificed his life in the endeavor to meet his creditors. Constable himself did not long survive his misfortunes. He became publisher of the *Scots' Magazine* (1801) and of the *Edinburgh Review* (1802), and owner of the *Encyclopedia Britannica* (1812), which he enlarged. He edited also a 'Chronicle of Fife' (1810) and wrote a 'Memoir of George Heriot' (1822). Consult Constable, 'Archibald Constable and His Literary Correspondents' (3 vols., Edinburgh 1873), and Lockhart, 'Life of Scott' (7 vols., London 1838).

CONSTABLE, Archibald, and His Literary Correspondents, a work by Thomas Constable (1873). It is the story of the Edinburgh publishing house which established the *Edinburgh Review;* initiated the publication of cheap popular volumes of literature, art and science; and by a bold liberality in payment of authors, with remarkable sagacity in judging what would succeed with the public, virtually transformed the business of publishing. In October 1802 the first number of the *Edinburgh Review* appeared. The generous scale of payment soon adopted — 25 guineas a sheet — startled the trade, and greatly contributed to make Constable the foremost among publishers of his day.

CONSTABLE, Henry, English poet: b. Newark, England, 1562; d. Liége, Belgium, 9 Oct. 1613. His chief work was his book of sonnets, 'Diana,' published in 1592, when few sonnets in the Italian form had been written. He was probably the author also of the 'Forest of Fancy' (1579), attributed to Chettle. Suspected of treason against Elizabeth, he was compelled to leave the country, and on his return in 1604 was confined in the Tower for a short time. His lyric 'Diaphenia' and his pastoral 'Venus and Adonis' take a high place in contemporary song.

CONSTABLE, John, English pastoral painter: b. East Bergholt, Suffolk, 11 June 1776; d. London, 1 April 1837. His father was a wealthy miller, and was at first desirous that his son should enter the Church, and then on finding him disinclined to this career, proposed that he should follow his own business. At the latter employment he continued for several years, but his favorite pursuit was painting, and in this he would occupy his leisure hours. After considerable objection on the part of his father, but encouraged by Sir George Beaumont, he entered as a student of the Royal Academy in 1799. For many years his progress as an artist was extremely slow. He did not sell a single picture to a stranger until 1814, but he had one or two private buyers who detected the promise of great things in his work. In 1816 he married secretly Maria Bicknell, who died in 1828. In 1819 his 'View of the River Stour' attracted some attention, and procured him admission as an associate of the Academy. His talent first received recognition abroad: he was awarded the medal at Lille in 1824, and another at Paris in the following year. Then followed his admission as a member of the Royal Academy (1826) — a tardy recognition which he did not value much. Constable's pictures are remarkable for the truth and vividness with which country scenes and natural phenomena are represented. Fuseli said of them that they made him call for his umbrella; and a French critic declared that his leaves and grass were bespangled with morning dew. He chose "unpicturesque" localities for his exquisite pastorals, and was the first to abandon the brown grounding adopted by the Dutch School for fresh and natural tints. For the first 12 years of his career he was able to develop along his own lines by having private buyers, and ever after that, it was by the inheritances to which he succeeded, not by what he earned, that he was enabled to live. Some authorities regard him as the founder of the impressionist school which culminated at Barbizon. Among the finest of his works are 'A View of Salisbury Cathedral'; 'The Cornfield'; 'The Lock'; and 'The Valley Farm.' Lately several good examples of Constable's art have been added to the Louvre, and the late Henry Marquand presented two fine pictures by him to the Metropolitan Museum of Art in New York. Consult Leslie, 'Memoirs of Constable' (1845); Wedmore, 'Studies in English Art' (1876–80); Brock-Arnold, 'Gainsborough and Constable' (1881); Chesneau, 'La Peinture Anglaise' (1882); Muther, 'History of Modern Painting' (1896); Holmes, C. J., 'Constable and his Influence on Landscape Painting' (New York 1903); and memoirs by Henderson, M. S. (1905), Tompkins (1907) and Bankart (1910).

CONSTABLE (Lat. *comes stabuli,* count of the stable = master of the horse). 1. A great noble under the later Roman Empire, and so down through the Middle Ages; usually the commander-in-chief of the army; in France also of the navy, and the chief subject in the state, when Richelieu abolished the office in 1627. Napoleon revived the title but not the authority, and it lapsed with him. In England the lord high constable and the earl marshal held the courts-martial and courts of chivalry; but Henry VIII left the office unfilled, and it is only revived temporarily for great pageants. There were constables who were wardens of castles, and whose office is still existent, hereditary or appointive. 2. In England, a petty constable was the chief parish officer for keeping the peace, but is now mostly supplanted by the police. 3. In the United States, outside of cities and incorporated villages, the constable is still the chief conservator of the peace. The office was borrowed from England, and in colonial times was of high importance, including functions now assigned to various other officers. In New England he was appointed by the selectmen, in Virginia by the hundred, in other provinces or States chosen by the town. He not only made arrests, imprisoned, had right of search and executing processes, etc., but he was often tax collector, overseer of the roads, and even petty judge, and gave notice of town-meetings. There was no legally defined scope of his duties, each community deciding them for itself, but the place was always considered one of power and dignity. Philadelphia and New York had high constables, the latter up to about 1830, when his functions were given to the chief of police. The office of "constable of the commonwealth" has also been created in some States. Consult Bacon, 'New Abridgement of the Law'; Dalton, 'The Country

Justice: Containing the Practice, Duty and Power of the Justices of the Peace.'

CONSTANCE (Ger. *Constanz*, or *Konstanz*, ancient CONSTANTIA), Germany, city and lakeport in the grand-duchy of Baden, occupying the only territory belonging to Germany on the south side of the Lake of Constance, at the place where that lake communicates with the arm known as the Untersee, «Lower Lake,» and where the Rhine issues from it, 35 miles northeast of Zürich. It is 1,300 feet above sea-level. The chief edifices are a cathedral, the Kaufhaus, in which the famous Council of Constance sat from 1414 to 1418, and which deposed three anti-popes, and condemned Huss and Jerome of Prague; an ancient palace; a grand ducal residence. The city has manufactories of linen and cotton goods, carpets, chemicals and sacking. Constance is said to have been founded in 378 A.D. by Constantius Chlorus as a bulwark against the Alemanni. In the Middle Ages, when it reached the height of its prosperity (at the time of the Council it was able to receive 20,000 visitors), it was frequently called Kostnitz. It was annexed to the Austrian dominions in 1548, and to Baden in 1805. Pop. 27,591.

CONSTANCE, General Council of, the 16th ecumenical council of the Church, was held at Constance in Switzerland; it was presided over by Pope John XXIII, in its opening session 5 Nov. 1414, and was dissolved in its 45th session 1418. It was called at the suggestion of the Emperor Sigismund for the purpose of dealing with the Hussite heresy; of considering measures for the general reform of the Church, and of restoring peace to the Church, which was troubled with schisms owing to the rivalry of three claimants of the papal throne. There was Balthasar Cossa, styled John XXIII: his title seemed to be sound in point of law, but the man was eminently unfit for the office; then there was Petrus de Luna, styled Benedict XIII: he was a Spaniard, but was chosen by the French cardinals: his style, Benedict XIII, was formally disallowed when the Pope, Vincenzo Marco Orsini, who at first assumed the style of Benedict XIV (1724), afterward changed that to Benedict XIII; and there was Angelo Corario, styled Gregory XII: both of these had been condemned as perjured men, heretics and schismatics, by the Council of Pisa, which Council «deposed» them; but they still claimed papal honors. Besides the healing of these schisms, the Council was called to take measures for repression of Wiclifism in England and analogous heresies in Bohemia and elsewhere. Also the Council was to consider the ways and means of effecting a «reformation of the Church in head and members.» In the Council were some of the eminent divines of the time, among them Pierre d'Ailly and Gerson, chancellor of the University of Paris, both sturdy advocates of reform; and also bishops representing the churches of England and Ireland. It is said that more than 18,000 priests, together with their retinues and many merchants and artisans, formed the brilliant crowd that collected in the city. John Huss, chancellor of the University of Prague, summoned to plead in the Council to the charge of maintaining the Wiclifite heresies, attended, having come under a safe-conduct of the Emperor Sigismund. The Council condemned the doctrines of Huss and ordered him to be given up to the civil power, to be dealt with according to the laws: he perished at the stake. Jerome of Prague met with the same fate. Memorable among the acts of this Council is its decision of a question submitted to the fathers regarding the succession to the sovereignty of the margraviate of Brandenburg. The Council recognized the superior validity of the claim of Conrad of Hohenzollern; from him is sprung the royal line of Prussia. The Council in the 12th session 29 May 1415 published a decree deposing John XXIII, who after a while formally resigned. In the 14th session Gregory XII (Corario) gave in his resignation. Petrus de Luna (Benedict XIII) refused to resign: but being no longer sustained by the king of Spain, he was simply ignored, and Cardinal Otto Colonna was elected Pope 11 Nov. 1417 under the style of Martin V. The schisms caused by the rival popes were ended. After a few reformatory measures, quite inadequate for the needs of the situation, were enacted, the Council was dissolved 22 April 1418. Consult Richtenthal, 'Kronik des Konziliums in Konstanz' (Augsburg 1553; Tübingen 1882); Creighton, 'A History of the Papacy during the Reformation' (London 1882); Wylie, 'The Council of Constance' (ib. 1900); Finke, H., 'Forschungen und Quellen zur Geschichte des Konstanzer Konzils' (Paderborn 1889); Valois, N., 'La France et le grand schisme d'Occident' (Vol. IV, Paris 1902).

CONSTANCE, Lake (anciently LACUS BRIGANTINUS; German *Boden See*), in central Europe, forming a common centre, in which Switzerland and the territories of Baden, Würtemberg, Bavaria and Austria meet. Length, northwest to southeast, 40 miles; greatest breadth, about 10½ miles; area, 204 square miles; greatest depth, 827 feet; 1,309 feet above sea-level. At its northwest extremity the lake divides into two branches or arms, each about 14 miles in length; the north arm is called the Überlingen Lake after the town of Überlingen, on its north bank; the south branch the Zellersee or Untersee. The Rhine enters the lake at Rheineck, at its southeast extremity, and leaves it at Stein, at its northwest termination. The lake, the waters of which are of a dark-green hue and very clear, are subject to sudden risings, the causes of which are unknown. In 1770 it rose in one hour from 20 to 24 feet above the ordinary level. It freezes in severe winters only. It is frequented by numerous aquatic birds, and contains a great variety and abundance of fish, including salmon, salmon-trout, pike and carp. The traffic on it is considerable, although its navigation by sailing vessels is rendered dangerous by sudden and violent squalls. There are numerous remains of lake dwellings on its shores. Steamers ply on the lake between Constance and various points on its shores. The principal towns are Constance, Bregenz, Friedrichshafen, Lindau and Rorschach. The land near is either flat or gently undulating, and fertile, and is covered with corn-fields, orchards and gardens, interspersed with ruined castles, and other remains of the Middle Ages, and with numerous towns and villages, producing altogether a very pleasing and striking effect.

CONSTANS, Flavius Julius, Roman emperor: b. about 320 A.D.; d. in Gaul 350 A.D. He was a son of Constantine the Great, and divided the empire after the death of his father with his brothers, Constantine II and Constantius II, receiving for his share Illyricum, Italy and Africa. Constantine, who invaded his provinces, having been slain in the battle of Aquileia, Constans became emperor of the whole West. He was weak, profligate and rapacious. His misrule caused an insurrection in Gaul under Magnentius; he fled to Spain, but was overtaken at the foot of the Pyrenees by the soldiers of the usurper, and slain. Constans protected the creed of Nice against the Arians and the Donatists, and closed the pagan temples.

CONSTANS, kôn'stän', **Jean Antoine Ernest,** French statesman: b. Béziers, 3 May 1833; d. Paris 1913. He was a professor of law in 1876, when he was elected a deputy and affiliated with the Left Centre. He was Undersecretary of State in the Freycinet Cabinet in 1879, and was Minister of the Interior in the Freycinet and Ferry cabinets of 1880–81. After serving for one year as governor-general of Indo-China, he was compelled in 1888 to resign this position as incompatible with his duties as a deputy. From 1889 to 1892 he was again Minister of the Interior, and his vigorous measures served to overthrow Boulangerism. In 1897 he was elected to the Senate, and in the following year became Ambassador to Constantinople.

CONSTANT, kôn'stän', **Jean Joseph Benjamin,** French portrait painter: b. Paris, 10 June 1845; d. there, 26 May 1902. He studied in the École des Beaux-Arts at Toulouse and Paris, and under Cabanel. A journey to Morocco in 1872 strongly influenced his artistic development. He has exhibited with growing distinction, at successive salons, from that of 1860, with his 'Hamlet,' his 'Samson' in 1872, his 'Scenes from Algiers' in 1873–74, his great historical painting of 'Mohammed II in 1453' in the Exposition of 1878, and in 1885 a large Oriental subject, as melodramatic as possible, with splendid rendering of the human figure and strong effects of color. Other noted canvases by him are 'Le roi du désert'; Le tigre favori'; and portraits of Mrs. Walters; Madame Calvé; Queen Victoria, exhibited in the Salon of 1901; Queen Alexandra; and De Blowitz. A good example of his portraiture is 'Mon Fils André' (Luxembourg), which took the medal of honor at the Salon in 1896. He was the fashionable artist of his time in Paris and London. His noble picture of 'Justinian' is in the Metropolitan Art Museum, New York. He was decorated with the Legion of Honor in 1878. He was a writer of repute, best known for his studies of contemporary French painters. Consult Stranahan, 'Modern French Painters' (New York 1893).

CONSTANT DE REBECQUE, dę-rę-bĕk', **Henri Benjamin,** French politician and author: b. Lausanne, Switzerland, 25 Oct. 1767; d. Paris, 8 Dec. 1830. His mother died at his birth and his father was an officer in the military service of Holland. He was brought up at Brussels at the home of Mme. de Nassau; studied at Erlangen in Franconia, and later at Oxford and Edinburgh where he met Mackintosh and became familiar with the government of the British Isles which he admired very much. Here he began his governmental studies in his paper 'Essai historique sur les mœurs des temps heroïques de la Grèce.' His ill health and general dissatisfaction with life caused him to leave England. He returned to Switzerland in 1786, where he remained but a short time, leaving for Paris in the following year. Here at the salon de Suard he met Mme. de Charrière, a woman of great mental powers, 27 years older than himself, with whom he formed a liaison which lasted for almost 10 years. A wild affair took him to England for a brief visit. After his return he became chamberlain at the court of Charles William of Brunswick. Here he married Mlle. Wilhelmine, Baroness of Chramm, a woman of little beauty but good intellect. His father became involved in political difficulties. The matter was finally settled satisfactorily with Benjamin's assistance and his father was not only exonerated but made a general. At this period Benjamin ventured on some new literary projects: 'Account of Corsica and Memoirs of Paoli' (1768), 'De la religion'; he undertook a comparison of the customs of the Greeks with those of the Celts, Germans, Scotch and Scandinavians. After Brunswick's manifesto against France, he divorced his wife (1794) and returned to Lausanne. He now entered upon a period of political restlessness and personal entanglements which consumed his entire life. At Lausanne he met Mme. de Staël, for whom he conceived a violent passion, and followed her to Paris in 1795. In the republican circle of which she was the centre, he soon became an important figure. He was a staunch supporter of the Directory and of a moderate republicanism. The consistent factor in his political life was his desire to see France a well-governed state. In defense of this he published his first political pamphlet, 'De la force du gouvernement,' in which he sought to induce all of the parties of the Directory to rally against the Counter-Revolution. This essay involved him in a duel with Bertin de Veaux,— one of a series of such encounters. In 1793 his title as a citizen had been contested on the ground of his Swiss birth, but his election as president of the canton of Luzarches and the reunion of Geneva and France in 1799 suppressed the question. About this time he formed the constitutional club of Salm, named after the hotel where it held its séances. It was formed to oppose the Royalist faction at the club of Clichy. In attempting to find a working middle ground, he joined forces with Barras and Talleyrand against Carnot and Barthelemy — a move which he regretted later. In 1799 he was made member of the Tribunate where he was attacked violently for his republican sentiments, which alienated the trust of Napoleon, and in 1802 he was finally eliminated. Mme. de Staël was held accountable for his republicanism, and she was also banished. Constant followed her to Germany, where her salon again became renowned at Coppet. He spent much time also at Weimar, where he became steeped in the religious and literary opinions of Schiller, Wieland, Schlegel, Müller and Goethe. He returned to Coppet in 1805; contracted a short liaison with Mme. Lindsay and eventually became married secretly to Charlotte de Hardenberg in 1808. At this time he produced a tragic poem, ‹Wallenstein,› after the manner of Schiller's trilogy. At Hardenberg he lived for a time with his wife's parents, where he worked on his book on religion. Here he was influenced by the spiritual mysticism of Herder, Cremer, Schleiermacher and Heeren, and his sceptical philosophy was lost. His father died in 1812. Constant continued his studies and published several political pamphlets attacking imperialism. At Hanover, he received a visit from the crown prince of Sweden who conferred on him the Royal Star. After the abdication of Fontainebleau he returned to Paris and at the salon of Mme. de Staël once more became an ardent publicist in behalf of liberal principles and freedom of the press. A series of pamphlets set forth his views on these subjects. During the One Hundred Days his political policy was decidedly weak. The return to Paris of Napoleon caused him to flee for a short time, but he soon returned, doubtless because of his unrequited passion for the famous beauty, Mme. Récamier, and had an interview with Napoleon who appointed him a Councillor of State. After Waterloo and the return of Louis XVIII he went to England, where he published ‹Adolphe,› the first psychological romance. It is largely autobiographical. Mme. de Charrière and Mme. de Staël are the prototypes of the heroine. In 1816 he returned to Paris, where he founded two liberal journals in which he renewed his advocacy of freedom of the press and liberal constitutionalism. In 1819 he was re-elected to the Chamber of Deputies; and again in 1824 and 1827. Although ill and crippled, he took part in the coronation of Louis Philippe, and on 27 August was made president of the Chamber of Deputies. His position was weakened by the acceptance of 200,000 francs from the king for the payment of his gambling debts which he had accrued when the death of Mme. de Staël in 1817 had caused him to withdraw almost entirely from society. In 1830 he was presented to the Royal Academy, but was rejected. Constant's egoism and his amours prevented his political ability from reaching its highest point. His greatest contribution to his party lay in his persistent fight for the freedom of the press. He was a poor debater, but the brilliant forcefulness of his philippics minimized that fault. His speeches are collected in ‹Discours› (2 vols., 1828); his essays on government in ‹Cours de politique constitutionelle› (4 vols., 1817–20). His book on religion, ‹De la religion considérée dans sa source, ses formes, et ses développements› (5 vols., 1825, 1831), is generally considered his best work. Consult Sainte-Beuve, ‹Nouveaux lundis› (Vol. I, Paris 1863), and ‹Portraits littéraires› (Vol. III, ib. 1864); Constant's own ‹Cahier Rouge,› which contains his autobiography from 1767–87 (1907), and ‹Journal intime› (1804–16, re-edited with ‹Lettres à sa famille,› by D. Melegari, 1895); his letters to Mme. de Charrière and Mme. Récamier, edited by Mme. Lenormant (1882); Rudler, G., ‹La jeunesse de Benjamin Constant› (1900); and ‹Bibliographie critique› (1909).

Rose Boochever,
Editorial Staff of The Americana.

CONSTANTIA, a district in the province of Cape of Good Hope, South Africa, on the eastern and northeastern slopes of Table Mountain range, and distant from Cape Town seven miles. Constantia consists of only three estates, High, Great and Little Constantia, which have long been famed for the quality of the wines produced upon them. The wines are sweet wines of delicious aroma, both red and white. Consult Mrs. Trotter, ‹Old Cape Colony› (London 1903).

CONSTANTINE (kŏn'stăn-tīn) **I,** Pope. He was elected in 708 and died in 714. The principal events of his reign were the submission of Felix, archbishop of Ravenna, to Rome; and Constantine's confirmation of the Quinisextan Council at Constantinople. There was also an anti-pope of this name, who usurped the holy office in 767.

CONSTANTINE I, Flavius Valerius Aurelius Constantinus, called the Great, Roman emperor b. Naissus, in Mœsia (Serbia), 27 Feb. 274; d. Nicomedia, 22 May 337. He was the son of the Emperor Constantinus Chlorus, and after the death of his father was chosen emperor by the soldiery, in the year 306. Galerius was very unwilling to allow him the title of Augustus, and gave him that of Cæsar only. Constantine, however, took possession of the countries which had been subject to his father, namely, Gaul, Spain and Britain. He overcame the Franks, who had formerly overrun the territory of Gaul, made prisoners of two of their leaders, followed them over the Rhine, surprised and defeated them. He then directed his arms against Maxentius, who had joined Maximian against him. In the campaign in Italy he saw, it is said, a flaming cross in the heavens, beneath the sun, bearing the inscription, «*In hoc signo vinces*» (Under this sign thou shalt conquer). He accordingly caused a standard to be made in this form, which was called the *labarum*. Some days after this he vanquished the army of Maxentius, under the walls of Rome, and drove it into the Tiber. He then entered the city in triumph, set at liberty all whom Maxentius had unjustly imprisoned and pardoned all who had taken up arms against him. He was declared by the Senate chief, Augustus, and *pontifex maximus*. In the year 313, together with Licinius, he published the memorable edict of toleration in favor of the Christians. By this every one was allowed to embrace the religion most agreeable to his own mode of thinking, and all the property was restored to the Christians that had been taken from them during the persecutions. They were also made eligible to public offices. This edict marks the period of the triumph of the cross and the downfall of paganism.

Constantine had married his daughter to Licinius; but the latter, jealous of his fame, conceived a mortal hatred against him, which he displayed by persecuting the Christians. Both emperors took up arms and met in Pannonia 314 a.d. Licinius was defeated, but the conqueror granted him peace. He, however, renewed hostilities, was vanquished again, taken prisoner and put to death at Constantine's command. Thus the latter became, in 325, the sole head of the Eastern and Western empires. His first and chief cares were the establishment of peace and order, and the propagation of his religion. Many beneficial decrees were proclaimed by him. Among these were those which abolished all the establishments of debauchery, ordered the children of the poor to be supported at his expense, gave permission to complain of his officers and promised that the Emperor would not only hear complaints, but compensate the complainants for injuries received, when they were proved to exist. He diminished the land-taxes and caused a new valuation of estates to be taken. The state treasury had always been enriched by the property of criminals; but Constantine spared the property of their wives and ameliorated the condition of their children. Death in prison, he said, was a cruel punishment for the innocent, and an insufficient penalty for the guilty; he therefore ordered all trials of prisoners to take place at once. He forbade the use of unwholesome dungeons and oppressive chains. He gave leave to sick persons, widows and orphans to appeal from the local magistrates, and refused this privilege to their adversaries. It had been customary for the heirs of a person deceased to divide his slaves among them; Constantine forbade the separation in these cases of husbands from their wives and of parents from their children. To the Christians he gave permission not only to erect churches, but to be remunerated for the cost of them from his domains. Amidst all the cares of government and the occupations of war he found leisure to assemble the Council of Arles, to put an end to the schism of the Donatists. The ecumenical council held at Nice, in Bithynia 325 A.D., was attended by him in person.

On 26 Nov. 329 he laid the foundations of a new capital of the Empire, at Byzantium, upon the Bosporus, in Thrace. The city of Byzantium had been almost entirely destroyed by Severus; it was rebuilt by Constantine, enlarged and adorned with open squares, fountains, a circus and palaces, and called by his own name. Constantine divided the Empire into four parts, governed by four prætorian prefects. Toward the close of his life he favored the Arians, to which he was induced by Eusebius of Nicomedia; and he even banished many Roman Catholic bishops. In the year 337 he fell ill in the neighborhood of Nicomedia, was baptized, and died after a reign of 31 years.

Constantine committed a great political error in dividing his empire among his three sons, Constantine, Constantius and Constans. His zeal for Christianity appears to have been excited not less by the knowledge that the religion which was embraced by a majority of the inhabitants of the Roman Empire must prevail, and that, of course, the strength of the government must be increased by protecting it, than by a wish to apply its consoling powers to the relief of a heavy conscience. He has been accused of inordinate ambition, excessive liberality and an Oriental fondness for parade. But he was brave at the head of his army, mild and indulgent in his intercourse with his subjects, the favorite of his people, the terror of his foes. He was fond of the sciences as well as of arms, and gave them his protection. He read much, and wrote nearly all his own letters. In Eusebius we find many proofs of his theological learning. Some of the martyrologists have counted him among the saints, and fix 20 May as his festival. The Greeks and Russians observe it upon the 21st of the same month. Among all the writers who have attempted to describe the character, influence and policy of Constantine, Gibbon, from the extent of his researches and the profoundness of his views, appears to deserve the first place, though his impartiality is more than doubtful. Consult Eusebius, 'Vita Constantini'; Gibbon, 'Decline and Fall of the Roman Empire'; Firth, 'Constantine the Great' (New York 1905); 'Cambridge Mediæval History' (Vol. I, ib. 1911); Fletcher, 'Life of Constantine the Great' (1852).

CONSTANTINE II, Flavius Claudius Constantinus, Roman emperor: b. Arles, Gaul, 7 Aug. 312; d. near Aquileia, Italy, 340. He was the eldest son of Constantine I, and received as his share of the empire, on the death of his father, Gaul, Spain and Britain. Being desirous, however, of possessing himself of the territory of his brother Constans, he invaded the latter's dominions, but was defeated and killed.

CONSTANTINE III, a son of the Emperor Heraclius: b. 3 May 612; d. 23 June 641. He reigned only a few months after his father's death.

CONSTANTINE IV, Flavius Constantinus, Emperor of the East; surnamed POGONATUS, or the BEARDED: d. 685. He was son of Constans II, whom he succeeded in 668. His two brothers, Tiberius and Heraclius, shared the title of Augustus, but had little or no share in the government, and toward the close of his reign Constantine IV, under the influence of suspicion, had them mutilated and put to death. Constantinople was unsuccessfully attacked by the Mussulmans in 672 and the six following years; and it was during these wars that the famous "Greek fire" was invented. He was unable to repel the attacks of the Bulgars who crossed the Danube and settled in the country which they still inhabit (679). Constantine convoked and took part in the sixth general council held at Constantinople, at which the doctrine of the Monothelites was condemned.

CONSTANTINE V, Emperor of the East: b. Constantinople 719; d. near Selymbria, Thrace, 14 Sept. 775. He was surnamed COPRONYMUS and succeeded his father, Leo the Isaurian, in 743. He sided with the Iconoclasts, who hurled down the images of the saints, and persecuted the followers of the Roman Catholic Church. The important result was that the Pope turned to Pepin, king of the Franks, for protection, and thus shifted the dependence of the popes from Constantinople. In spite of his religious persecutions, he was a splendid civic ruler, and did much to restore trade and commerce. He died in an expedition against the Bulgarians.

CONSTANTINE VI, Flavius Constantinus, Emperor of the East: b. 771; d. Constantinople about 797. He was son of Leo IV, whom he succeeded in 780. Being only 10 years old when his father died, his mother, Irene (q.v.), was his guardian and regent of the Empire. On arriving at a mature age he wished to assume the government himself; but Irene, made cruel by ambition, had him imprisoned. He escaped in 790, exiled his mother, recalled her, and finally, ruined by his licentious living, and despised by his subjects, Irene led a conspiracy against him. He was imprisoned and his eyes were put out by her order. With him the Isaurian dynasty died out. Consult Schlosser, F. C., 'Geschichte der bilderstürmen-

‘den Kaiser des oströmischen Reichs’ (Frankfurt-am-Main 1812).

CONSTANTINE VII, Emperor of the East: b. 905; d. 15 Nov. 959. He was surnamed Porphyrogenitus (born in the purple), and succeeded Leo the Wise as sole ruler in 945. He was destitute of energy, and devoted himself chiefly to study and the patronage of arts and letters. He admitted colleagues to the throne so that at least five emperors were reigning together. He was poisoned by his son Romanus in 959. Constantine VII left a treatise on state affairs, a geography of the empire and the ‘Life of the Emperor Basilius, the Macedonian.’ Several important works, to which we are indebted for historical knowledge, undertaken at his instigation, were ‘Historica,’ ‘Basilica,’ ‘Geoponica’ (agricultural treatises), ‘Iatrica’ (medical handbook), ‘Hippiatrica’ (on veterinary surgery), ‘Historia animalium,’ a compilation of Aristotle's views on the subject by Aristophanes of Byzantium, with additions from other writers. Consult Migne, ‘Patrologia Græca’ (cix, cxii, cxiii); Rambaud, A., ‘L'Empire grec au dixième siècle’ (1870).

CONSTANTINE VIII, Emperor of the East: d. 1028. He was the son of Romanus II, succeeded John Zemisces, and was proclaimed emperor of the East, with his brother, Basil II, who held the principal authority till 1025, when he died. Constantine VIII was, after that, sole emperor.

CONSTANTINE IX, surnamed Monomachos, was emperor from 1042–55. He owed his position to his marriage with Zoë, the widow of Romanus III, who became empress in 1041. His reign was occupied with rebellions both at home and abroad. He had to wage war against the Turks, the Normans, the Patzinaks and the Russians.

CONSTANTINE X, Ducas, emperor from 1059–67: b. 1007; d. 1067. He was the husband of Eudoxia. He succeeded Isaak Comnenus, whose friend and minister he had been. He was unsuccessful in repelling the attacks of the Normans in Italy and of the Turks and Magyars as well, and thus lost large portions of the kingdom. He besieged the Russians in 1043. A plague was more effectual in resisting the encroaching enemies.

CONSTANTINE XI, Palæologus, Dragatses or Dragoses, Emperor of the East: b. 1394; d. 29 May 1453. He was the son of Manuel II and the last of the Greek emperors, succeeding to the throne in 1448. His wife, Helena, was of the dynasty of Palæologus. He took possession of Morea and of much of the Peloponnesus and defeated the Turks in many battles. In 1446 Murad II forced him to surrender the Peloponnesus again. He was killed in bravely defending Constantinople against Mahomet II, who in 1453 besieged the city with 300,000 men. The heroic valor displayed by Constantine XI in this unequal contest demands our admiration; but valor was of no avail, the city was taken by storm, and thus ended the Greek Empire. Consult Mijatovich, ‘Constantine, the Last Emperor of the Greeks’ (London 1892).

CONSTANTINE, Nikolaevitch, Russian grand duke: b. Saint Petersburg, 21 Sept. 1827; d. there, 24 Jan. 1892. He was the second son of the Emperor Nicholas of Russia, and brother of the Emperor Alexander II, grand duke and great admiral of Russia. In the war of 1854–56 he had the defenses of the Baltic entrusted to his care, in conjunction with Admiral Lütke; but the policy of the emperor hardly allowed the prince any display of courage or ability. He supported his brother's liberal reform plans and worked earnestly for the enlightenment of Russia. He was made viceroy of Poland in 1862, but resigned next year. He was president of the council of state 1865–81, but being suspected of sympathizing with the revolutionary party was dismissed from office. When Alexander III became king, he removed his uncle from all of his important offices, and Constantine retired to the Crimea.

CONSTANTINE, Pavlovitch, Russian grand duke: b. Saint Petersburg, 8 May 1779; d. Vitebsk, 27 June 1831. He was the second son of the Emperor Paul of Russia, and with his brother Alexander was brought up under Catharine II. In the wars against France he distinguished himself by his personal bravery, though not by his capacity for command. He was the elder brother of Emperor Nicholas, to whom he ceded the crown on the death of Emperor Alexander I, their brother. Constantine was afterward made viceroy of Poland, and ruled that unfortunate country with great severity. Poland revolted in 1830 and he was obliged to flee. He died of the cholera.

CONSTANTINE, Africa, town in the French territory of Algeria, capital of the department of Constantine, on a rocky peninsula, 2,162 feet above the sea, 830 feet above the river Rummel, which washes it on two sides, and accessible only on one side. It is surrounded by walls, built by the Arabs chiefly with stones which the Romans had hewn and carved, and is entered by four handsome gates. The streets, though well paved, are narrow and dirty, and the houses are very indifferent. The only edifice deserving of particular notice is the palace of the bey, now the residence of the French governor. It is more remarkable for its internal decorations than for its external structure. Both within the town and in the vicinity Roman remains abound. It is the episcopal see of a Catholic bishop. The modern or French portion has wide streets and open squares. Its principal buildings are the Palais de Justice, administration buildings, the Protestant church and a theatre. The French have here a college and the Mohammedans a seminary. The manufactures consist chiefly of woolen and linen goods and various articles in leather; the trade is in corn, linen and wax. It is connected by railroad with Philippeville, its port of entry, 47 miles distant, and with the largest towns in the territory. Constantine was built by the emperor whose name it bears, on the site of Cirta, the capital of the Numidian kings, which had fallen into decay. In 1837, after a long siege, the French took it by assault. Pop. 61,413.

CONSTANTINE, Arch of, one of the noted triumphal arches of the world, erected by order of the Roman Senate to commemorate the victory gained by Constantine over Maxentius. It is situated between the Cœlian and Palatine Hills, and was built in 315. This monument of victory is well preserved, but while it tells of the power of the Emperor Constantine, it also bears witness to the incompetency of the Roman sculptors of the period in which it was built. The whole design was copied from the Arch of Trajan, even the reliefs were removed to the Arch of Constantine, and they illustrate the battles and victories of Trajan and not of Constantine. The parts copied or taken from Trajan are of superior design and workmanship, but the sculpture of the artists of the day, representing the deeds and victories of Constantine, are inferior in design and crude in workmanship. Four stately columns are on each face, one high and two lower entrances. The inscriptions proclaim the great deeds of the emperor. The arch was left standing in the Middle Ages probably because it was built by a Christian emperor. Consult Platner, 'Topography and Monuments of Ancient Rome' (New York 1911); Frothingham, 'The Mystery of the Arch of Constantine Unveiled' (in the *Century Magazine* for January 1912); Frothingham, 'Who Built the Arch of Constantine?' (in *American Journal of Archeology,* 2d series, Vols. XVI, XVII, 1912–13).

CONSTANTINOPLE, Turkey («the city of Constantine»), called *Istambol* by the Turks (corrupted into *Stamboul*), from the Greek *eis tēn polin,* to the city; in official Turkish always «Constantinieh»: capital of the Ottoman Empire, situated at the junction of the Bosporus and the Sea of Marmora, in lat. 40° 0′ 16″ N., long. 28° 59′ 14″ E. It is practically an agglomeration of three towns, Stamboul, Galata-Pera and Skutari, besides a number of suburbs scattered for a distance of 12 miles along both sides of the Bosporus. The two first-named are on the European shore, divided by the Golden Horn, an inlet of the Bosporus about 500 yards wide and nearly six miles long.

Stamboul, or Constantinople proper, occupies the site of ancient Byzantium, built, like ancient Rome, on seven hills. The peninsula on which the city stands has the form almost of a triangle or, more correctly, of a trapezium, surrounded on all sides by water excepting the west, with a total waterfront of some 12 miles in extent. The eastern side projects into the Bosporus; the western forms a lofty double wall of five miles in length, stretching across the promontory from the Sea of Marmora to the Golden Horn; on the opposite side of the latter, also occupying the extremity of a promontory, sometimes called the Peninsula of Pera, are the extensive suburbs of Galata, Pera, Top Haneh and Kassim Pasha. Galata (formerly Sykæ = fig-trees) received its name from the Gauls who formed a settlement there. It is now the district where the banks, shipping agencies, stock exchange and offices of the representatives of European firms are established. Pera, adjoining Galata, is situated on the heights immediately above it, and is called the European or «Frankish» quarter. Here the Europeans, Levantines and most of the Greek and Armenian population live, and all the hotels, embassies and consulates are situated. Kassim Pasha is a dirty, insalubrious district around the dockyard, near which the Turkish fleet generally lies at anchor. Prominent on a plot of land stretching into the Golden Horn is the Admiralty, a fine marble building, and close by are the graving-docks, slips, building sheds and workshops. Directly above is the Naval Hospital. Opposite Kassim Pasha, on the Stamboul side, lies Phanar, a grimy suburb, inhabited mainly by Greeks. It is the seat of the patriarch and contains the Greek Cathedral of Saint George. Just beyond lies Balata, noted for its filthy condition, almost exclusively inhabited by Jews; the better class Jews live at Haskeui, on a hill opposite Balata, with a large percentage of Armenians. Farther up, on the opposite shore again, lies the village of Ayub (Eyoub), exclusively inhabited by Moslems; no Christians are allowed to hold property here. The spot is deeply revered by the faithful on account of the mosque built by Mohammed II, the Conqueror, in which each succeeding sultan is girded with the sword of Othman at the coronation ceremony. The adjoining burial ground contains the mausoleums and graves of numerous high personages. Skutari, properly «Usküdar,» over the Bosporus, stands on the site of ancient Chrysopolis; population, about 50,000. Its main objects of interest are the British and Turkish cemeteries and the convent of Howling Dervishes. The British Cemetery is the finest in Constantinople, and is situated at the Marmora end of Skutari, near Haidar Pasha. In it are buried many British soldiers who died during the Crimean War; one part was reserved for the interment of British residents. Adjoining the cemetery is the Skutari Hospital, once the scene of the devoted labors of Miss Florence Nightingale (q.v.) and her staff of British nurses. The Turkish Cemetery is the largest in Constantinople — a vast city of the dead — a wilderness of tombs — thickly planted with the funereal cypress. On a submerged rock off Skutari is the square lighthouse known as Leander's Tower, a name given to it by the Crusaders, though it has no connection with the legendary hero of that name. The Turks call it Kiz Kuleh, or the Maiden's Tower. It was first built as a mausoleum in 340 B.C., subsequently became a wooden lighthouse and was gradually replaced by a massive stone tower 90 feet hight. Skutari has several theological colleges, schools, baths and a large Turkish printing-press, founded 1723. Haidar Pasha and Kadikeui, farther south, face the Sea of Marmora; the former is the terminal of the Constantinople and Angora Railway and a favorite Moslem picnic resort; the latter, standing on the site of ancient Chalcedon, is largely a European residential district, having all-day steamer communication with Galata. The other suburbs on the Asiatic side of the Bosporus above Skutari are, next, Kuzgunjik, a Jewish village where the Chief Rabbi resides; Beylerbey, exclusively Turkish, with a fine mosque and a white marble palace; the latter formerly contained the private menagerie of Abdul Aziz; Chengel Keui, a village; Kulehli, or Kuleh Bagtcheh (Garden Tower), where some 25 years ago Roman and Byzantine tombs, columns and marbles were unearthed; Vani Keui, founded 1665; Kandili, on the site of ancient Perirrhous; Anadoli Hissar (q.v.); Kanlija (bloody village), so named from the color of the rocks; Chibukli, where Saint Marcellus founded the monastery of the Order of Vigilants in 420 A.D.; Pasha Bagtcheh, notable for its fine mosque built in 1763; lastly, Beikos, the largest village on the Bosporus, with extensive vineyards and a palace built by Mehemet Ali

Pasha of Egypt. Crossing over to the European shore again and starting from Galata up the Bosporus, the following suburbs and places of interest included with Constantinople are Top Haneh (cannon building, i.e., gun foundry); Kaba Tash; Beshik Tash («cradle-stone»), the tomb of Ghazi Khaireddin, «the terror of the Christians»; Orta Keui a large village the ancient Saint Phocas, containing great market-gardens, the Yeni Valideh Mosque, and residences of state ministers; near by is the imperial residence, Yildiz Kiosk (q.v.); Kuru Chesmeh, a dirty village inhabited by Armenians and Jews, formerly the residence of Wallachian Hospodars; Arnaut Keui (q.v.), the Byzantine Michaelion; Bebek (q.v.), where the famous Robert College (q.v.) is situated; Rumeli Hissar (q.v.), the «Citadel of Europe»; Balta Liman, where the treaties of 1838, 1841 and 1849, relating to the Danubian tributary states, were signed; Boyaji Keui, a village; Emirghian, site of the ancient Kyparodis, famous for its cypress grove, mosque, marble fountain, college, summer residences and palaces; Stenia (q.v.); Yeni Keui, containing ambassadorial summer residences and magnificent villas of wealthy Levantines; Therapia (q.v.), the famous health resort; and Buyukdereh («Great Valley»), also a summer resort for the wealthy, situated 11 miles from Galata.

Constantinople is far from being a beautiful city, yet its natural position and picturesque appearance combine to make it one of the most gorgeous sights in the world — at a distance, which in this case truly «lends enchantment to the view.» No other city can claim to be situated on two continents, Europe and Asia; and certainly none has a more thrilling and romantic history. Poets, artists and authors have endeavored in song, color and prose to depict the vision of Constantinople from the deck of a vessel on a fine summer's morning. It resembles rather some enchanted city of the ‹Arabian Nights› than a real town of stone, bricks and mortar. The seven low-lying hills covered with buildings of all descriptions down to the water's edge, painted in more colors than the rainbow can boast of, with white kiosks, marble palaces, cypress trees, minarets and cupolas piercing the heavens, with a background of soft blue Oriental sky and a foreground of the Sea of Marmora, in the limpid waters of which the town is reflected as in a mirror; the Golden Horn, crowded with shipping and bright with the flags of all nations; innumerable caïques (rowing and sailing boats) and steam launches bearing gaily-attired civilians and uniformed officials; the multitude of different languages and jargons that greet the ear, marking the dividing line between the poetic East and the prosaic West: all these make up a rare confusion of form, color and sound, land, sky and water, that create a lasting and indescribable impression on the mind. Gibbon was fascinated by the scene, «formed by Nature for the centre and capital of a great monarchy»; Aubrey de Vere wrote that «the view of Constantinople from the sea is the most splendid of all the pageants presented to the human eye by the metropolitan cities of the earth.» More recently Dr. Edwin A. Grosvenor wrote, «In the word ‹Constantinople› there is the blended magic of mythologic romance, history, and poetry . . . . the queen city of the earth, seated upon a throne.» He also calls attention to the remarkable fact that the same great parallel which encircles the globe between 40° 20′ and 41° 50′ in north latitude includes Constantinople, Rome, Madrid, New York and Chicago.

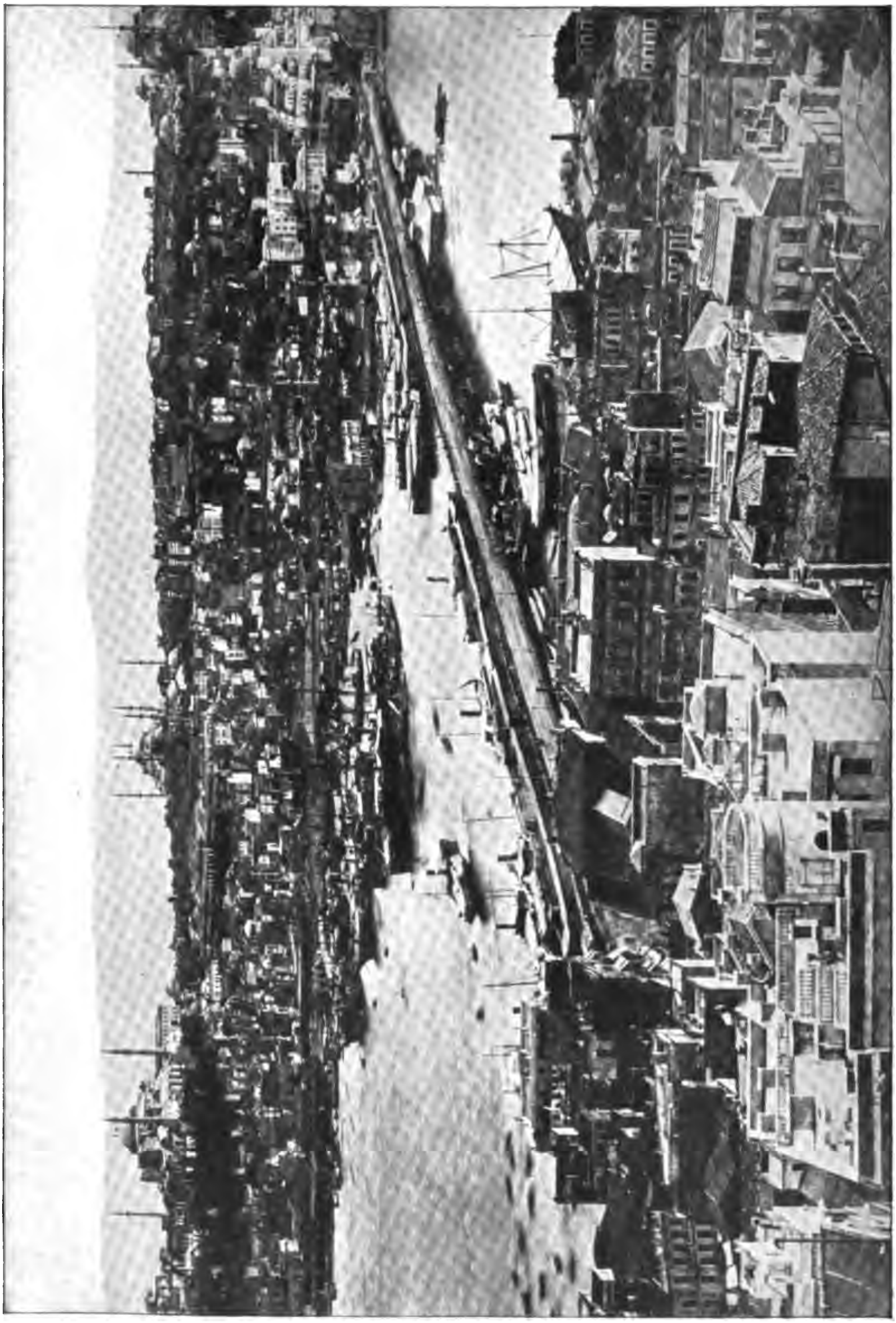
But the scene changes suddenly and painfully when the traveler steps ashore and proceeds to stumble along the narrow, dirty, wretchedly-paved alleys which do duty for streets, and climbs the rocky staircase leading from Galata to Pera. Until 1910 he had to pick his way cautiously among and over the countless mangy, half-starved pariah dogs which infested the town and lived on street garbage. These have since been captured by gypsies, conveyed in caïques to the isle of Oxia in the Sea of Marmora and left to devour each other. Noisy, vociferating *hamals* or porters shuffle along the streets staggering under heavy loads and shouting «wárda!» (look out!); donkey drivers and muleteers yelling at their animals; hawkers and pedlers shrieking out the excellence and cheapness of their wares; vermin-ridden beggars thrust mutilated stumps of limbs under the pedestrian's gaze to evoke sympathy; while over all hovers the insufferable stench arising from heaps of garbage.

Population.— In the absence of any reliable official statistics the population of Constantinople is estimated at between 1,000,000 and 1,200,000, about half being Mohammedans and the rest Orthodox Greeks, Armenians, Jews, Europeans, Africans and Asiatics.

The climate is healthy on the whole but extremely variable, and unsuited for those suffering from pulmonary affections. The best time for visiting Constantinople is in April, May, September and October, before and after the hot season.

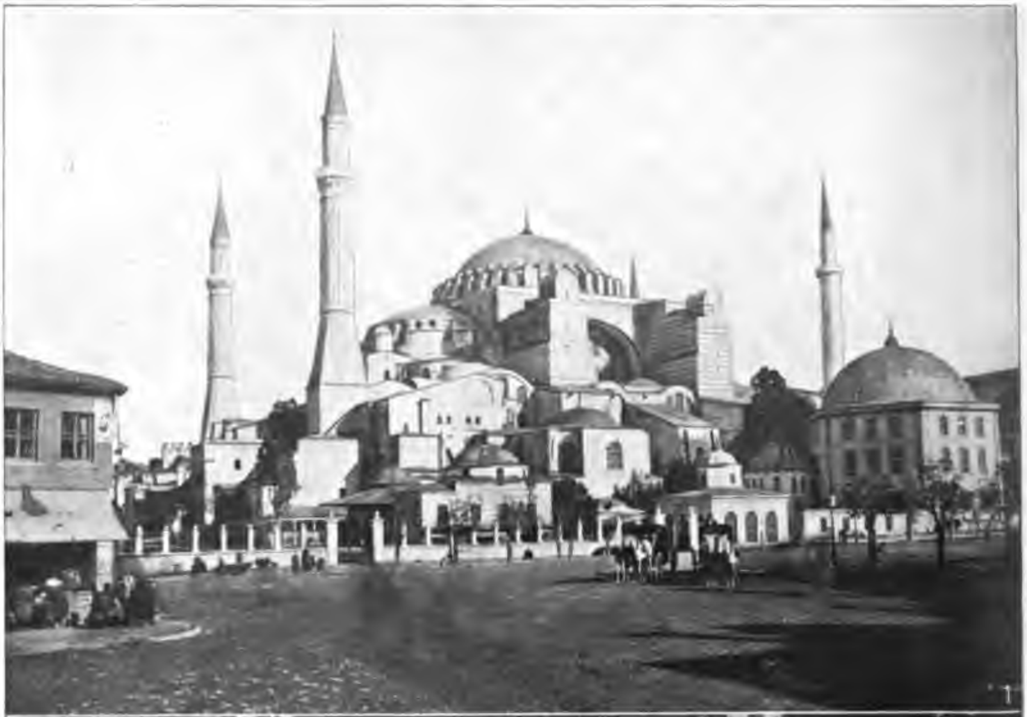
Walls.— Constantinople was formerly walled on all sides; very little now remains of the walls on the seaward sides, but those on the land side are still in a fair state of preservation and extend across the peninsula from Ayub to Yedi Kuleh (Seven Towers) on the Sea of Marmora, from which begin the Walls of Theodosius (3½ miles), a double line with a moat 64 feet wide and a breastwork 58 feet thick running between them. The moat is now divided into market garden plots. The inner wall is 36 feet high and was flanked by 116 towers, of which about 90, in a dilapidated condition, still remain. The outer wall is 31 feet high and 13 feet thick, and was flanked with 78 towers, most of which are still there. Fourteen gates led through the walls, seven being formerly used for military purposes. Of the Seven Towers, the Byzantine citadel, three were destroyed by earthquake in 1758. The place also served as a state prison. The main gates are the Golden Gate, Yedi Kuleh Kapu, Yeni Kapu (New Gate), Silivri Kapu, Mevlevi Haneh Kapu, Top Kapu (Cannon Gate), Eghri Kapu (Crooked Gate) and Edirneh Kapu (Adrianople Gate). Near the Golden Gate is the grave of Ahmed Kiupruli Pasha, who was hanged on his return from the capture of Candia after a 24 years' siege. Each of the gates is rich in historical associations, inscriptions and architectural embellishment. An excellent account of these is given in the Constantinople guide book of D. Coufopoulos (London 1895). Beyond Tekfur Sarai stand the Wall of Leo the

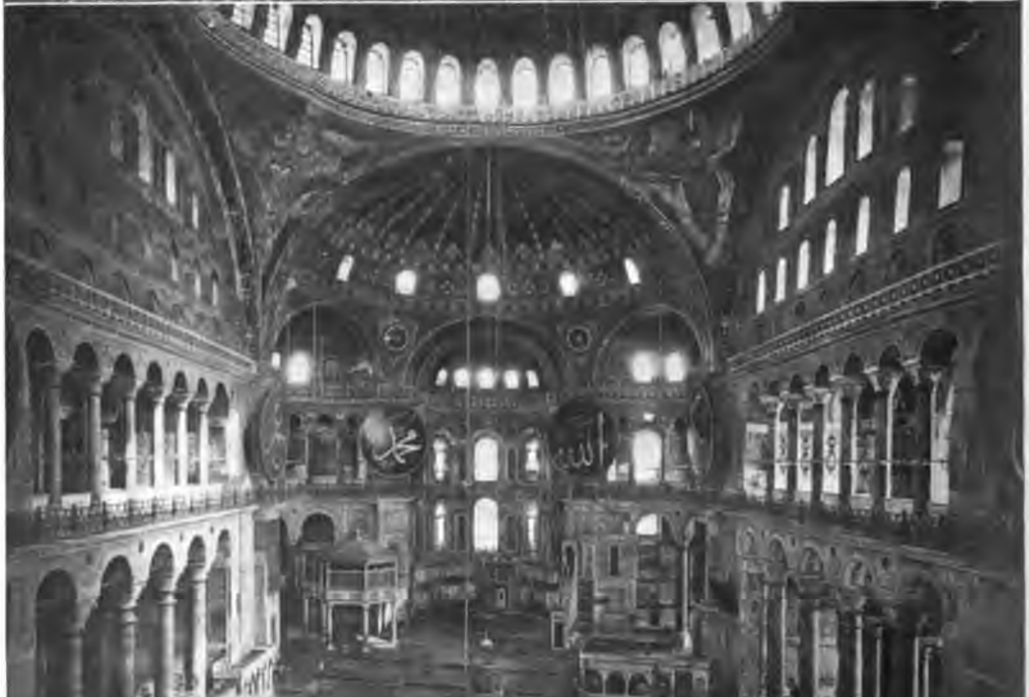
CONSTANTINOPLE



BIRD'S EYE VIEW OF CONSTANTINOPLE

CONSTANTINOPLE





Photographs by G. Berggren, Constantinople

1 Mosque of Aya Sofia — Saint Sofia, the ancient Christian "Church of the Divine Wisdom" founded 532; dedicated 538
2 Interior

Armenian (813 A.D.) and the Wall of Heraclius (627 A.D.).

Mosques and Churches.— There are 379 mosques scattered over Constantinople and environs, all of them more or less distinguished by grandeur and beauty; but the most remarkable are the royal mosques, of which there are about 15, among the finest in the world. Of these the largest and most splendid is the Suleimanieh, situated on the northeast side of the city, and standing in the midst of a large square, surrounded inside by an arcade upon pillars of granite and marble. Next to it in extent, but of much older date, is the famous mosque of Saint Sophia («Ayiah Sofia»), near the east extremity of the city, the pattern of almost every mosque in the land; its walls and domes, of which last it has 20 of equal dimensions, springing from the same level, and sustained by 12 huge columns, are encrusted with mosaics, forming various figures and devices. The court or open square in which it stands is paved with marble and shaded by fine plane-trees. It was restored by Italian and English architects in the 19th century by order of the sultan, and the layer of plaster removed by which the superb mosaics and frescoes that decorate its walls were covered. The mosque of Yeni Djami, known also as that of the Sultana Valideh, was built by the mother of Mohammed IV, and is esteemed one of the most magnificent in the capital. It is constructed of white marble and has two peculiarly elegant minarets, encircled by three galleries of richly perforated workmanship. The principal dome rests upon four lesser ones, which appear to lift it to the clouds. The celebrated mosque of Sultan Ahmed is noted for its vastness and its enormous columns, 75 feet in circumference. The minarets are of great beauty and ascend to an immense height. The mosque of Sultan Bayazid contains the finest courtyard in the city. A vast number of pigeons haunt its precincts. Rustem Pasha mosque is remarkable for its tile work. The church of Saint Irene is now used as a museum of ancient arms. Among its relics are the swords of Mohammed II and Skander Bey and an armlet of Tamerlane. The Mehemet Pasha mosque is supposed to be the ancient church of Saint Anastasia Pharmakolytria, of the 5th century. All the other mosques are much less in size than those described, but very much resemble them in plan and other features. All of them are encircled by splendid columns of marble, Egyptian granite or serpentine, and have massive and highly ornamented gateways and porches, and handsome courts and cisterns for ablution. The church of the Fountain of Life and the Blachernæ Church are Byzantine edifices still belonging to the Greeks.

Monuments, etc.— Among other historic monuments of Constantinople are the magnificent tombs of the sultans Selim II, Mahmud II, Suleiman the Great and Mohammed II; the obelisk of Theodosius, the Serpent Column, the Colossus in the Hippodrome, the Porphyry or Burnt Column, Marcian's Column, the Column of Theodosius II in the Seraglio and the Column of Arcadius; the Philoxenos and the Basilica water cisterns; the China Pavilion; the Hippodrome («At-Maidan» = Race Course), originally laid out by Septimius Severus on the model of the Circus Maximus in Rome, 1,300 feet long and 600 feet wide; the aqueduct of Valens; the fountain of Sultan Ahmed; and the fire towers of Galata and Stamboul. The Imperial Museum of Antiquities contains a magnificent collection of treasures; of minor importance is the Museum of Ancient Costumes.

Palaces.— Besides the smaller palaces already mentioned, there are the Old Seraglio, the Dolma Bagtcheh and Yildiz Kiosk. The first of these, situated on the promontory named Seraglio Point, at the junction of the Bosporus and the Sea of Marmora, was for centuries the residence of the Byzantine emperors and Turkish sultans. It now contains the Treasury, the Imperial College of Medicine, the Mint, an art school and the Museum of Antiquities. The beautiful Dolma Bagtcheh Palace (q.v.) lies on the Bosporus, while Yildiz Kiosk, the residence of the sultan, is a collection of palaces and other buildings. (See YILDIZ KIOSK and HAREM). The Cheragan Palace, also on the Bosporus, was destroyed by fire in 1910. It was built by Abdul Aziz, and here he committed suicide in 1876.

Bridges, Bazaars, etc.— Two iron pontoon bridges span the Golden Horn and connect Galata with Stamboul. They have each a draw to allow the passage of vessels. The bazaars are numerous; some are covered, others open. The covered bazaars have a somewhat mean appearance, resembling a row of booths at a fair, but the arrangement and manner of exposing the gay and glittering wares is sufficiently attractive. The principal or Great Bazaar consists of long avenues covered over with lofty arches of brick, lighted by apertures in the roof and branching off in different directions. The ceilings of the vaults, and various parts of the walls, are ornamented with painted flowers and devices. On each side of the passage are counters and stalls, with a wide passage between them, and on each counter sits the merchant, generally smoking his pipe or chibouk, with his crossed legs drawn under him. The bazaars, both the open and covered, are severally allotted to particular trades and merchandise; they are generally so crowded that it is difficult to pass through them. The numerous public baths in the city are mostly of marble, of plain exterior, but handsome and commodious within, with every accommodation and appliance requisite. They are divided into a number of circular rooms, lighted from above, and sufficiently spacious to admit a number of bathers at the same time. There are a vast number of coffee-houses and lodging-houses, called khans, dispersed throughout the city. The latter resemble immense stone barracks or closed squares. They are intended for the use of strangers during their temporary sojourn in the city, who may have an apartment here, with command of the key. Considerable modern improvements have been made in the commercial section of the city. Electric cars and telephones have been introduced. French and German waterworks companies provide water from reservoirs in the forest of Belgrade.

Industry.— The few manufactures of Constantinople are chiefly confined to articles in morocco leather, saddlery, tobacco-pipes, fez caps, arms, perfumes, gold and silver embroideries, etc.; but its foreign commerce is considerable. The Golden Horn is deep, commodious, well sheltered and capable of containing 1,200 large ships, which may load and unload alongside the quays. It is usually crowded with vessels and light boats, and presents a lively, bustling scene. Among the imports are corn, iron, timber, tallow and furs from the Black Sea and Russia; cotton stuffs and yarn, woolens, silks, watches, furniture, jewelry, coffee, sugar, pepper and spices, spirits, etc. The exports consist of silks, carpets, hides, wool, goats' hair, madder, valonia, etc. In 1914 a tonnage of nearly 12,000,000 entered and cleared the port in 14,761 vessels.

History.— The city was founded, according to tradition, by a band of settlers from Megara under the leadership of Byzas, in 658 B.C., and received the name of Byzantium. It was in turn attacked by the Thracians, Bithynians, and even the Gauls; it was repeatedly invested by the Persians, who, during the campaign of Darius against the Scythians, compelled the town to surrender to Otanes, one of Darius's generals, and subsequently burnt it. After the battle of Platæa (479 B.C.) the Lacedæmonians under Pausanias took Byzantium from the Persians, and refounded the colony. Seven years later the town was captured by the Athenians; within 30 years it revolted and returned to its former allegiance. It was again besieged and taken by Alcibiades in 408 B.C. The Athenians remained in possession for three years when they lost the town again to the Spartans under Lysander. A few years later Xenophon with his 10,000 passed through it on their march from Persia. In 390 B.C. it was once more brought under the sway of Athens. Philip of Macedon laid siege to the city in 340 B.C., but the Athenians, roused by the fiery eloquence of Demosthenes against the Macedonian conqueror, came to the rescue. After repelling Philip of Macedon, Byzantium had to submit, some years later, to Alexander, who passed it on to his successors. On the death of Lysimachus the city regained — and maintained — its independence for a century, until the mighty power of Rome invaded the region of Thrace and the Hellespont.

In return for the assistance it rendered to the Romans in their wars with Macedon and Antiochus, the Senate conferred on Byzantium the status of a «free and confederate city»; it lost these privileges under the Emperor Vespasian, and became an ordinary provincial town in A.D. 73. In the struggle between Septimius Severus and Pescennius Niger for the Roman Empire, Byzantium espoused the cause of the latter, but was captured by Severus after a three years' siege, and reduced to ashes. A few years later, however, he rebuilt the city, and embellished it with porticoes, magnificent public baths and a hippodrome. During the civil wars which followed the abdication of Diocletian, the city fortifications were restored, and afforded refuge to Licinius after his defeat by Constantine at Adrianople in A.D. 323. Constantine then advanced on Byzantium, and, by means of constructing ramparts and towers as high as those of the city, finally succeeded in taking it.

The name «Byzantium» now disappears, and «Constantinople» takes its place. The city is also called «Roma Nova,» or «New Rome,» for it is raised to the dignity of capital of the Roman Empire, thanks to its geographical position, which alone is responsible for its vicissitudes and chequered fortunes. A new political centre was required for the reunited Empire; frequent wars with Persia, revolts of Asiatic nations, incursions of Scythians, troubles at Rome and a host of other considerations demanded that the capital should be transferred further eastward. Christianity was established, the city was dedicated to the Virgin Mary, and the foundations of Saint Sophia were laid. The old capital was plundered of its art treasures to decorate the new, and a 40 days' festival inaugurated the second founding of the city. Immigration was encouraged, schools were built, liberal laws enacted and a bishop, afterward raised to the rank of patriarch, was appointed. Historic Church Councils were held on the Bosporus — in 337 A.D., against the Arian heresy; in 359, when 150 orthodox bishops added to the Nicene Creed; in 553; in 681, when Pope Agatho presided; and again in 870, to condemn the iconoclasts, and when the Emperor Basil attended.

But Constantinople was not destined to tread the path of peace and Christianity. The decline had set in; the fall was at hand, and a new star had risen in the East — Islam. The city had been attacked by the Huns in 450; again by the Huns and Slavs in 553, and by the Persians in 626. The Saracen conqueror, Moawiyah, besieged the walls for seven years, and finally abandoned the enterprise. A second invasion by the Saracens under Moslemah was repulsed in 718, and toward the end of the 8th century the hero of the «Arabian Nights,» the redoubtable Calif Harun al Rashid, planted his standard on the heights of Skutari, but was drawn off by concessions. During the 9th and 10th centuries Constantinople was assailed by six invasions — from Bulgaria, from Hungary, and four times from Russia.

In 1096 the Crusaders, under Godfrey de Bouillon, passed on their way to Jerusalem. The fourth crusade turned aside from their holy purpose, and decided to take Constantinople, with the aid of the Venetian Republic. The plan succeeded, and Baldwin, Count of Flanders, the valiant leader of the Norman knights, was elected to the throne. This new dominion lasted 58 years, during which time a large European army held the city. The Latin rule collapsed when the Crusaders evacuated Palestine, and the Greek Empire was restored, with the assistance of the Republic of Genoa. In return for their aid the Genoese were granted exclusive rights in Galata, which they promptly surrounded with walls, behind which they claimed independence, and defied the emperor. A state of civil war ensued within the city, which was kept up till the final conquest by the Turks. Sultan Bayazid determined to obtain possession of Constantinople in 1396. He commenced this task, but had to leave it suddenly to defend his own territories against Tamerlane. Bayazid was defeated in that encounter, and taken prisoner, in 1402. Twenty years later, his grandson, Murad II, after delivering his country from the Mogul yoke, led his victorious army to the gates of Constantinople. The reigning emperor, John Palæologus, yielded to his demands, and purchased an alliance by a heavy annual tribute. Murad II was a true Moslem, and kept his engagements religiously. For the 30 years of his subsequent reign Constantinople was insured against Turkish aggression. His son, Mohammed II, abrogated the treaty, and built a fort («Cut-Throat Castle») on the European side of the Bosporus, which remains to this day. In 1453 Mohammed arrived with 60,000 horse and 20,000 foot. The city could only muster 7,000 defenders. After a desperate struggle of 40 days, the city was captured, and Saint Sophia was converted from a Christian church into a Mohammedan mosque. The dust had claimed the Byzantine, the Roman and the Greek Empires, and the sword of Othman has held the city on the Bosporus against all comers for over four centuries and a half.

The more important historic events which have taken place in Constantinople since then may be briefly summarized. Peace was concluded there between Turkey on the one side and Venice, Spain and the Pope on the other, in 1540; another peace treaty between Turkey and Russia in 1700; and an abortive alliance between Prussia and Turkey against the ambitions of Russia and Austria. In 1821 a massacre of Greeks took place, in which the Greek Patriarch was hanged. The rising of the Janissaries and their complete annihilation occurred in 1826. In the same year 6,000 houses and many palaces were destroyed, whilst other serious conflagrations, as well as earthquakes, worked their havoc upon the city in 1714, 1755, 1808, 1883, 1890, 1893, 1894, 1908 and 1910. The most disastrous fire for a century broke out 31 May 1918 and in two days covered 2½ miles of old Stamboul, destroying over 5,000 houses, 20 baths, a dozen bazaars and as many mosques. Over 200,000 were left homeless.

It was in Constantinople, too, that the alliance between Great Britain, France and Turkey against Russia was concluded — a few weeks before the Crimean War broke out. In the winter of 1876–77 the Great Powers held a futile conference here with a view to settling the Eastern Question, but could not prevent the Russo-Turkish war which followed. In February 1878 the Russian army reached almost to the gates of the city, and forced the Treaty of San Stefano upon the Porte, while British warships lay at hand to prevent the capture of Constantinople. In 1909 Sultan Abdul Hamid II was deposed, and Shevket Pasha entered the city at the head of the Macedonian army and the new régime was announced. During the Balkan Wars of 1912–13 the Balkan Allies almost reached the walls of the city, and again in 1915 the French and British attempted to capture Constantinople by forcing the Dardenelles. See WAR, EUROPEAN.

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HENRY F. KLEIN,
Editorial Staff of The Americana.

CONSTANTINOPLE, General Councils of. The most important of these ecclesiastical councils were: the First, attended by 150 Eastern bishops, and held in 381 is reckoned as the second ecumenical council of the Church; the first being that of Nicæa in Bithynia, 325. Its president was at first Miletius, patriarch of Antioch, and after him Gregory of Nazianzus, then archbishop of Constantinople. The council, comprising only Eastern bishops, was not reputed ecumenical till after the Western Church had approved its decrees by express or tacit consent. The council defined the creed of the Church as opposed to the heresy of Arius and kindred heresies growing out of it, among them the heresy of Macedonius who denied the godhead of the Holy Spirit; hence to the creed called of Nicæa this council added the clause, «and in the Holy Spirit, the Lord and life-giver who proceedeth from the Father, who with the Father and the Son is together worshipped and glorified, who spake by the prophets.» Not till a later date was added «and the Son» (in Latin filioque) to declare the procession of the Spirit from the Son also. The Second Council of Constantinople — the fifth ecumenical — was held in 553, with 165 bishops, all Eastern. The heresies it condemned had relation to the heresy of Nestorius, who held that there were in Christ two persons, a human and a divine. This council, at first regarded as Oriental, was later accepted as ecumenical. Vigilius, the Pope, refused to attend, and was excommunicated. The council was accepted by the emperor, and was generally received in the East, but was repudiated in the West. A schism resulted which lasted until the synod of Aquileia about 700. The Third General Council of Constantinople, held in 680, was presided over by legates of the bishop of Rome, Pope Agatho. The errors it condemned were those of the Monothelites (q.v.). It anathematized all Monothelites living or dead, especially Sergius and his successors, the former Pope Honorius and Macarius, the patriarch of Antioch. The banned sect fled to Syria where they formed the sect of the Maronites. It was the Sixth ecumenical council. The Quinisext Synod (692) was regarded as supplementary to the fifth and sixth ecumenical councils. Its work was legislative and its decisions were set forth in 102 canons. The synods of 754 and 815 set forth decrees against image worship. The Fourth General Council of Constantinople (the eighth ecumenical), held in 860, was convoked for the purpose of ending the schism then separating the Eastern from the Western Church. This council decreed the deposition of Photius, the usurping patriarch of Constantinople, and the restoration of Ignatius the rightful patriarch; but both this decree and the measures proposed by the council for reconciling the Eastern with the Western churches were repudiated by the Greek Church; and the schism grew wider and has continued, with an interval of communion now and again till the present time. Consult Mansi (Vol. III, pp. 521–599; Vol. IX, pp. 24–106, pp. 109–922; Vol. XII, pp. 575 seq.; XIII, pp. 210 seq; XIV, pp. 111 seq., 787 seq.; XV, pp. 143–476; XVI, pp. 1–500; XVII, pp. 66–186, 365–530).

CONSTANTINOPLE, Strait of. See Bosporus.

CONSTANTIUS I, Flavius Valerius, Roman emperor, surnamed Chlorus: b. about 250; d. York, England, 25 July 306. He was nephew of the Emperor Claudius II, became Cæsar in 292, received Britain, Gaul and Spain as his government, and after re-establishing Roman power in Britain and defeating the Alemanni, became one of the Augusti in 305. He was distinguished for his intrepidity as a soldier and his breadth of humanity as a ruler. Constantine the Great, his son, was his successor.

CONSTANTIUS II, Flavius Julius: b. Illyricum 317; d. 361. He was the second son of Constantine the Great and Fausta, was emperor of Rome from 337 to 361, reigned first in the East, and waged a protracted war against the Persians, which prevented him from participating in the struggles of his brothers Constantine II and Constans in the West. After the fall of both he marched in 350 against Magnentius and Vetranio, who had usurped the purple. Vetranio submitted; Magnentius was finally crushed and committed suicide. Constantius now reigned over the whole empire. In 354, having returned to the East, he put to death his cousin Gallus, whom he had left there at the head of the army. He chose his cousin Julian as Cæsar, and sent him to Gaul, where he successfully fought against the Alemanni and Franks. In 360 Julian was proclaimed emperor by the army at Paris. Constantius marched against him, but died on the way in Cilicia. Julian was his successor. Consult 'The Cambridge Mediæval History' (Vol. 1, New York 1911).

CONSTANTS OF NATURE, a term applied to various unchangeable quantities that are found to be characteristic of natural phenomena or relations. The propagation of light through space takes place invariably at the rate of 186,770 miles per second, and hence the velocity of light may be referred to as a constant of nature. In choosing the units of precise measurement, which form the basis of all calculations in pure and applied science, it is necessary in certain cases to employ the constant quantities of nature. The constants of nature characterize natural phenomena and enter into all the mathematical laws of science. Consult Lupton, Everett, 'C. G. S. System of Units' (London 1902); Landolt and Börnstein, 'Physikalisch-chemische Tabellen' (4th ed., Berlin 1912); Clarke, 'The Constants of Nature' (5 parts, Smithsonian Miscellaneous Collections, Washington 1873–88).

CONSTELLATION, a famous United States vessel built in 1798, as one of the frigates ordered by the government for service against the Barbary pirates. It was commanded by Commodore Truxton and did service in capturing the French warship *L'Insurgente,* 1799, and won a brilliant victory over the French frigate *La Vengeance* (1800). During the entire War of 1812 the *Constellation* was blockaded at Norfolk. In 1815 she was part of Decatur's fleet in the Mediterranean, and was one of the squadron which captured the Moroccan vessel *Mashouda* after a conflict. Consult Maclay, 'History of the American Navy' (Vol. I, 1900).

CONSTELLATIONS (Lat. *con,* "together," + *stella,* "star"). From the earliest times men have formed certain groups of bright stars into constellations. Thus the names of the 12 zodiacal constellations are prehistoric. The same is true of many of those clustering about the north pole of the heavens. Quite a number bear the names of members of the Argonautic expedition, or of persons who were in some way connected with it, which determines the age of their formation approximately. The earliest description of the constellations of which we have any record is by Eudoxus, who lived about 360 B.C. This work is lost, but a poetic paraphrase of it by Aratus, who lived about 100 years later, is still extant. This work mentions 45 constellations. The earliest star catalogue which has survived to modern times is the 'Syntaxis', that is, 'Compendium.' This is usually known as the 'Almagest,' which means "The Greatest," of Ptolemy. His observations were made between 121 and 151 A.D. The catalogue contains 1,028 stars divided among 48 constellations. This completes the ancient classification, and no permanent additions were made to it until 1602, when one constellation was added by Tycho Brahe. The next year appeared Bayer's 'Uranometria,' a series of star-maps containing 1,709 stars and 12 new southern constellations. These maps were decorated by a series of drawings made by Dürer, whose outlines have until recently served to ornament the constellations as represented on certain maps and stellar globes. These were the first star-maps published, although stellar globes were introduced in the middle of the previous century by Mercator.

Before Bayer's time it was customary to describe the position of a star by its location in the animal or figure represented by the constellation. Thus Aldebaran was the bright star in the eye of the bull. From this it would appear that the ancients had manuscript maps with figures drawn upon them, but none of these maps have come down to our time. Bayer introduced the important innovation of lettering the various stars with the letters of the Greek and Roman alphabets, a separate set of letters being used for each constellation, thereby greatly simplifying the designation of any particular star. Strangely enough he did not letter his 12 new southern constellations, so that these stars still had to be designated by the cumbrous methods of the ancients. In Flamsteed's catalogue, issued early in the 18th century, the stars are numbered in the order of their right ascension, and both letters and numbers are still in general use. From the earliest times some of the brightest stars have received special names, such as Sirius, Arcturus, etc. Although these are still in common use, there is a tendency among astronomers to substitute Bayer's nomenclature in their place.

Following Bayer a number of new constellations were introduced by various astronomers, notably Hevelius, Lacaille and Royer. Many constellations were proposed which have failed to meet with universal acceptance, and the number which is now generally adopted by astronomers is 67. There is no definite agreement as to their exact outlines. Indeed, such an agreement would be impossible unless the boundaries followed definite circles of the celestial sphere. All stars brighter than the 9.5 magnitude are now designated by their numbers in certain large modern catalogues. Fainter stars are located by their right ascension and declination at certain dates. These quantities correspond to terrestrial longitude and latitude.

The shapes of the constellations are entirely matters of accident, and in only a few instances are the brighter stars contained in them arranged in such a manner as to bear any resemblance to the object for which the constellation is named. The exceptions to this rule are the Scorpion, the Southern Cross, the Northern and Southern Crowns and the Southern Triangle. On the other hand, certain characteristic forms are obvious in the heavens which bear no relation to the name of the constellation in which they occur. The Great Dipper in Ursa Major, known in England as Charles' Wain (or Wagon), the Y in Boötes, the Sickle in Leo and the Cross in Cygnus are well-known examples. Good modern star-atlases have been published by Schurig and by Upton. For the most complete work in English on the early history of the constellations and the origin of the names of the stars, consult Allen, R. H., 'Star Names and Their Meanings' (1899).

WILLIAM H. PICKERING,
Astronomical Observatory, Harvard.

CONSTIPATION, a condition in which the normal number of evacuations from the intestinal canal does not take place, or one in which the fæces are extremely hard and painful in passing. Constipation affects all ages, being prevalent in childhood, youth, adult life and old age. It can for the most part be regulated by proper hygienic living, but by reason of extreme carelessness in this regard is very prevalent.

The symptoms of constipation vary considerably. In infants there is always pain; the child cries, especially on attempts to defecate; there is usually much colic; there may be fever. In adult life the symptoms are fairly well marked. There is the time element, which is known; there is pain on passage, due to hardness of the fæces; and there may be feelings of bloating, coated tongue, headache or backache, all of which are characteristic of this condition. In fact the symptoms which are described very widely in patent-medicine circulars as due to disease of the kidney, brain, lost manhood and vague menstrual irregularities are the usual symptoms of ordinary constipation, and the patent-medicine business succeeds largely because it ascribes to this extremely common malady names of very much more dangerous illnesses. Practically most patent medicines are hardly more than cathartics.

The causes of constipation are in the main two,— lack of water in the intestines and lack of muscular tone of the unstriped muscle of the intestinal walls. Lack of water may result from insufficient drinking of water. It may also result from increased elimination of water, as in excessive sweating. It may also be the result of diminished secretions of the normal juices of the intestines,— the gastric juice, the bile from the liver and the pancreatic and intestinal juices.

These are all essential in adding fluid to the intestinal canal. Insufficient muscular power in the intestines may be due to a number of causes. Lack of tone of the body in general, resulting from insufficient exercise and insufficient food, is one of the most important. Bad dressing is a second cause for this loss of muscular tone. It may be a symptom of a nervous disorder such as is very frequently found in paraplegia, in locomotor ataxia and other grave spinal disorders, in which case the motor paralysis is more or less permanent. Lack of muscular power may also be the result of taking fluid diet; thus the intestine has less of the proper type of stimulus and the muscular power is not invoked. A frequent cause of constipation is tea-drinking. The most frequent cause of constipation is unconscious hate. This causes too much tension in the muscles of the lower bowel with the retention of the fæces.

The treatment of constipation is self-evident if one takes into consideration the two underlying causes and remedies them. The drinking of water, outdoor exercise, sunlight, the eating of food that has plenty of residue, such as bread, spinach, lettuce, cabbage, celery, etc.; these are very helpful. The first absolute necessity, however, in the treatment of constipation is to establish a habit of regular daily movement. In order to do this it is essential that a time should be taken which is ordinarily not interfered with, and the individual should consider a certain 15 minutes of the day to be sacredly devoted to this duty. So far as drugs are concerned in the treatment of constipation, they are best left alone; but if it becomes absolutely necessary that a drug should be used, it is a cardinal principle to remember that alternation of drugs is advisable. The same drug used day in, day out, and week after week, tends to diminish the power of the intestine and habituate it to a given drug. This results in some frightful cases of constipation. In a few cases of constipation in which the cause is due to some obstruction, as some solid body situated near the intestinal canal and pressing upon it, surgical treatment is imperative. The use of external massage is largely useless. The normal stimulus to muscular action comes from within — it is largely of unconscious nerve origin. It does not come from without. Constant use of enemas for constipation is a form of intestinal masturbation and leads to serious forms of neuroses and psychoneuroses, even to psychoses — or insanities, in later life. Hence the best type of treatment for most chronic constipations is mental. See CATHARTIC.

CONSTITUENT ASSEMBLY, a name given to the first convention of the delegates of the French nation (1787–91) to distinguish it from the Legislative Assembly of 1791. It drew up and obtained the acceptance of the first of the famous revolutionary constitutions. The Constituent Assembly of 1848 had a similar aim. See ASSEMBLY, GENERAL; FRANCE, HISTORY.

CONSTITUTION, the fundamental law of a state, whether it be a written instrument of a certain date, as that of the United States of America, or an aggregate of laws and usages which have been formed in the course of ages, like the English Constitution. Its primitive meaning is that of any law given force by proclamation and put into effect by the power of the supreme head of the government or nation.

I. Constitutions, according to their origin or their fundamental principle, may be divided into three classes: (1) Those established by the sovereign power; (2) those formed by contracts between nations and certain individuals whom they accept as sovereigns on condition of their complying with the terms of the contract; (3) those formed by a compact between different sovereign powers.

1. The first class may be again divided into: (*a*) constitutions established by a free sovereign people for their own regulation, of which sort is the Constitution of the United States; and (*b*) such as have been, in some instances, granted by the plenary power of absolute monarchs to their subjects, and which in theory are the voluntary gift of the beneficence of the ruler. These are called by the French *constitutions, octroyées,* from *octroyer,* to grant.

2. The second great class of constitutions mentioned above includes such as have been formed by a contract between the future ruler and the people. These are mutually binding on each party as long as the other fulfils his duty. Such, in a great degree, is the British Constitution.

3. Some constitutions are compacts between several sovereign powers. Such was the Constitution of the German Empire and that of the United Provinces of Holland, and such is also the Swiss Confederation. The Constitution of the United States, though the different States call themselves sovereign, proceeded, in point of fact, from the people of the United States collectively, as is apparent from the very beginning of the instrument: "We, the people of the United States," and not "We, the States." Moreover, the Congress, established by this Constitution, has rights and powers far exceeding those which other confederate but entirely distinct governments are wont to allow each other. The Constitution, in short, unites all the States into one nation, the government being called by all parties the national government. Governments entirely and virtually distinct from each other never would, however closely confederated, allow a government, particularly a national government, to be established over themselves. The Constitution of the United States is more than a mere compact between independent powers, yet less than the simple constitution of an undivided nation; it ought rather to be considered as forming one whole with the different constitutions of the States which have given up to the general government most of the rights of sovereignty, as that of making war and peace, coining, etc.

II. In regard to political principles, constitutions are: (1) Democratic, when the fundamental law guarantees to every citizen equal rights, protection and participation, direct or indirect, in the government, such as the Constitution of the United States and those of some cantons of Switzerland; (2) aristocratic, when the constitution establishes privileged classes, as the nobility and clergy, and entrusts the government entirely to them, or allows them a very disproportionate share in it; such a constitution as that of Venice, and such as, at one time, those of some Swiss cantons, for instance, Bern; (3) of a mixed character, to this latter division belonging some monarchical constitutions, which recognize the existence of a king whose power is modified by other branches of government of a more or less popular cast. The British Constitution belongs to this last division.

III. The forms of government, established by the various constitutions, afford a ground of division important in some respects; and, lastly,

IV. The principle on which a constitution establishes the representation, or the way in which the people participate in the government, furnishes an important means of classification: (1) Some allow the people to partake in the government without representation, as was the case in many of the small states of ancient Greece, and also in the ancient Roman republic, and is still the case in several of the small Swiss cantons, in which the whole people assemble and legislate; it being obvious that such a constitution can operate only where the number of citizens is very small, and even then will be almost always objectionable; (2) some are of a representative character; that is, all the citizens do not take an immediate part in the government, but act by their representatives; constitutions of this sort, either establishing a general and equal representation, as those of the United States; or connecting the right of representation with particular estates and corporations. The term representative constitution is frequently applied exclusively to the former by way of eminence.

V. Representative constitutions may be divided into: (1) Such as are founded on the union of the feudal estates, the clergy, nobility, citizens and peasantry, the two latter of which derive their right of representation from the charters of the ancient corporations; (2) such as establish the right of a general representation, like the American Constitution, and such as partake of both characters, like the British Constitution. Those of the first class either originated in feudal times or have been since copied from such as did. The feudal states were conglomerates of many heterogeneous bodies; and it was reserved for later ages to unfold the true principles of government, to separate the essential from the unessential and injurious, to give stability, distinctness and extent to principles before unsettled, indefinite and limited in their operation. See articles on the different countries of the world for information respecting their various constitutions.

CONSTITUTION, Framing of the. When the resistance to British rule in America began, independence was not its aim, and provisional governments only were established in the several colonies, temporarily to take the place of the English colonial governments, which had been suppressed. The several colonies jointly instituted the Continental Congress for the purpose of prosecuting the war. This Congress in June 1776 appointed a committee to frame an instrument of government. This was entitled the 'Articles of Confederation and Perpetual Union' (see CONFEDERATION, ARTICLES OF). It was not until 1 March 1781 that all of the States had finally signed it. Its defects were so numerous and serious that for a time it looked as if the Union would go to pieces. Several amendments were proposed and failed of adoption, chiefly because the approval of *all* States was necessary for an amendment.

By 1786 everything pointed to a speedy dissolution of the Union as it existed under the Articles of Confederation, when aid came from an unexpected quarter and quite by accident. This was the Annapolis Convention (q.v.), called to settle commercial disputes between Virginia and Maryland. The friends of efficient government dominated the convention; it had no authority but to regulate trade, but reported that nothing could be done under such a government, and recommended calling a fresh convention to amend it — the changes of course to be consented to by all the States. Congress issued the call for 14 May at Philadelphia; but a quorum (seven States, a majority) was not secured until the 25th. George Washington was appointed president; by 2 June four more States had come in, and on 23 July the New Hampshire delegation arrived. All were thus finally represented but Rhode Island, which was unalterably opposed to the scheme, and was the last to ratify the Constitution.

Three prime obstacles lay in the path of the convention: the small States' fear of the large; the one-crop States' fear of the national taxing power (and general tenacity of hold on the port dues by those which had ports) and the slave-trading States' determination not to have the business summarily stopped. The first, if not compromised, would have prevented any union at all, as the three "large States," Massachusetts, Pennsylvania and Virginia — New York then counting as a "small State" — were scattered through the line; commercial interests quite possibly might have created three confederacies, the New England, Middle and Southern; the slavery question would have created two, from New York to Delaware and from Maryland south. The first was assuaged by equal representation in the Senate; the second by the prohibition of taxing exports, with some other safeguards; the third by permitting the slave-trade for 20 years. These were three primary concessions which secured the votes of enough States to overlook the irregularity of the convention's title to create a new government, and join the Union under it; and without them there would have been no Union then, and most probably none now.

The first was by far the most difficult of all. The second and third could be and were cured by one or two single provisions, not difficult to draft nor very difficult to agree on; the first involved the very basic structure of the government, and cost a long struggle, great ingenuity and much doubt about ratification. The situation was this: The convention assumed as a basis of debate that the 11 States represented the following populations: Virginia, 420,000 (including three-fifths of the slaves, as with all the five Southern States); Massachusetts, 360,000; Pennsylvania, 360,000; New York, 238,000; Maryland, 218,000; Connecticut, 202,000; North Carolina, 200,000; South Carolina, 150,000; New Jersey, 138,000; Georgia, 90,000; Delaware, 37,000. New Hampshire with 102,000 came late, and Rhode Island with 58,000 held aloof altogether. The three largest States were regularly reinforced by the three southernmost, who were next to or mixed with huge and powerful Indian confederacies against which they would like to turn the entire national force, and therefore favored a strong government; this gave a pretty constant large State vote of six for a "national" system, where the weight should be in proportion to size, and a small State vote of five for a federative one, like the Confederation, where each State had one vote. This further involved that the latter should be a one-chamber system, since two houses each representing sovereign States equally would be an absurd duplication. These two irreconcilable propositions were embodied in what were called the "Virginia" and the "Jersey" plans.

The former, presented by Edmund Randolph 29 May, was intended to obliterate the States as bodies from the government almost entirely. It was, in substance, that the Congress should have two branches, membership in both proportioned to population, but the lower ones chosen directly by the people, the upper by the lower out of nominations by the State legislatures, the executive by both houses jointly; that Congress should have a veto on the State laws, and the President with a part of the judiciary a veto on those of Congress; that Congress might coerce delinquent States, and should legislate on all matters where State action would cause discord in the Union (that is, commerce and taxation); that new States might be admitted; that all the obligations of the Confederation should be assumed, that members of State governments should take oath to support the national government and that the new Constitution should be ratified by popular conventions instead of the State legislatures. A plan of Pinckney of South Carolina was in the same line. The committee of the whole, after debate and amendment, reported the amended bill favorably 13 June. The amendments had cut out the power of coercing the States, taken the veto from the judiciary and restricted it to the executive; made the executive's term seven years and not renewable, the senators' seven and the representatives' three; had the State legislatures choose the senators; and styled the new system a "national" government. Two days later, William Paterson of New Jersey presented the "Jersey plan," whose distinctive differences were that Congress should have but one chamber with each State voting equally, and should gain its revenue from requisitions as then, only having the power of coercing delinquent States. Coercion implied gaining a majority vote in an equal body to make war on one of the members, which would never have been granted. The other articles — that Congress should have the power of taxation and regulation of commerce and of coercing refractory individuals as well as States, also of deciding disputes as to territory, etc.— were no stronger than the weakest link; Congress was given some powers extra to those of the Confederation, but was given no whit more power to enforce them. What the Confederation had lacked was not privileges, but force. Paterson's plan otherwise was much like Randolph's. The convention in committee of the whole adhered to the latter.

Hamilton attempted to forward a plan by which the Senate was to be chosen for life by electors chosen by popular vote, the executive chosen for life by electors chosen by popular vote and the State governors to be appointed by the national government, with an absolute veto on the acts of the legislature. It found no supporters.

The first problem was to settle the basis of power between the States. Under Randolph's plan, the Senate would have had 28 members, of which the three «large States» would have had 13; and the House 65, of which they would have had 26 — two-fifths of the latter and about half the former. Obviously they would be able, by a bargain with one or two of the smallest States, to choose the President and dictate the entire operations of the government. On the other hand, Paterson's plan was practically the Confederation plus more wind and paper decrees. The deadlock was absolute. John Dickinson of Philadelphia suggested consolidating the two plans, which was like consolidating a democracy and an autocracy. But on 21 June William Samuel Johnson of Connecticut proposed the «Connecticut plan,» the one finally adopted, making the States equal in the Senate and proportional in the House. His colleague, Ellsworth, supported him; but the vote on it showed a tie, five large to five small States, and Georgia's delegation divided. The question was referred to a committee of one from each State, which reported a compromise to win over the large States by restricting the power of originating money bills to the House, which they would control, and secure the slave States by counting in three-fifths of the slaves as a basis of representation. With the addition of the power to the Senate to propose amendments to money bills, the compromise passed after a hot debate. The two New York delegates left the convention in wrath.

Another point which had to be compromised was the power of Congress over commerce. As matters stood, not only could each State lay any duties it pleased, so long as it did not violate treaties already made or take national property, and therefore fill the Union with prohibitive barriers, but a State like New York could ruin its neighbor, New Jersey, and deal a crushing blow at western Connecticut, whose port it was. Further, several States were not agriculturally diversified, but had one great crop of tobacco, or rice, or naval stores — a severe tax on which would bankrupt the entire State. The first of these difficulties was met at the outset by the conditional power given to Congress to regulate commerce between the States; the second was acknowledged by the insertion of the prohibition to tax exports, as said. A «committee of detail» reported a draft Constitution 6 August. It had 23 articles (finally boiled down to seven); the President was to have one term of seven years, and be chosen by Congress; there was no Vice-President, and the Senate chose a president for itself. This was debated till 12 September, and amended to its present form. The slave-trading States were given their solatium in the shape of permission to continue the trade for 20 years, and the entire slave group were placated by the fugitive-slave provision; the Vice-President and the electoral system were added, and a restriction of Congressional control of commerce to a two-thirds vote stricken out. On 12 September a committee of five was appointed to revise its form, and the actual work was mainly done by Gouverneur Morris (q.v.). The next day it was reported back, after a few changes — the chief requiring only a two-thirds instead of a three-fourths vote to pass a bill over a President's veto — and accepted. A new convention to consider amendments proposed by the States was voted down; they must take or leave it as it stood. Of the 55 delegates present, only 39 signed. On 17 September the convention adjourned. The Constitution and the resolutions of the convention were transmitted to Congress, which on 28 September ordered them sent to the State legislatures for action. (For the amendments, and the consequent difficulties about ratification, see CONSTITUTIONAL AMENDMENTS, HISTORY OF). Only three States — New Jersey, Delaware and Georgia — ratified it unanimously; Connecticut, Pennsylvania, Maryland and South Carolina, by heavy majorities; Massachusetts, New Hampshire, New York (see FEDERALIST, THE) and Virginia by light ones, after a bitter and protracted struggle; North Carolina refused to ratify without many amendments and a bill of rights, and Rhode Island refused altogether till it was carried without her and she would have been shut out. There was great dissatisfaction, and only the commercial classes were heartily in its favor: John Adams said afterward that the Constitution was «extorted from the grinding necessity of a reluctant people.» See UNITED STATES — ARTICLES OF CONFEDERATION; UNITED STATES — FEDERAL CONVENTION OF 1787.

CONSTITUTION, Immutability of the. The Constitution of the United States is the product of a few great minds assembled in a brief convention. A great statesman (Gladstone) has termed it «the most wonderful work ever struck off at a given time by the brain and purpose of man.» This characterization has been accepted by all thinking men. There have been, indeed, cavils at some provisions, and speculative suggestions of alterations and improvements by individual minds; but the universal wonder is that the framers of the Constitution did so well; and that wonder was never so great as now at the close of a stormy century, littered with the wrecks of governments and nations and dynasties and constitutions.

The «given time»! The work was great, the difficulties many — most men then deemed them insuperable — and the work and its difficulties have had commentators and historians for 70 years or more; but will there be a single reader of this article who has noted how short a time it took to frame the Constitution? Has there been a single commentator or historian who has adequately shown how exceedingly brief the «given time» was? Less than a hundred working days measured it.

Moreover, the framers had had no means of previous personal communication by telegraph and almost none by mail; there were no stenographers or typewriters; there was, indeed, no clerical assistance; for the proceedings of the convention were secret and the clerical work was done by great men. When we see recent conventions with modern facilities for rapid work spending months in putting a few patches on existing State constitutions, we can best appreciate the ability of the men who in 85 working days forged the great compact of the people of the United States with themselves — a compact which has lasted more than a century substantially unchanged, which survived the storm of the greatest civil war of the modern world, which has expanded with an unforeseen and unprecedented expansion of inhabited territory from a narrow strip upon the Atlantic seaboard to the shores of the Pacific, and which, notwithstanding changed conditions of life and thought, has grown steadily in the power of moral obligation and become more and more truly the “supreme law” of nearly 100,000,000 people.

As the time was brief, so were the framers few. The convention was composed of 55 members; the Constitution was signed by 39, including Washington; 51 members took part in the debates (according to the most complete report we have of them, the Journal of Madison), again including Washington. It is generally assumed that he took no part in the debates; but Professor Fiske has said in words which cannot be too often brought before the American citizen:

> It was suggested that palliatives and half measures would be far more likely to find favor with the people than any thorough-going reform, when Washington suddenly interposed with a brief but immortal speech, which ought to be blazoned in letters of gold and posted on the wall of every American assembly that shall meet to nominate a candidate or declare a policy or pass a law, so long as the weakness of the human nature shall endure. Rising from his President's chair, his tall figure drawn up to its full height, he exclaimed in tones unwontedly solemn with suppressed emotion: “It is too probable that no plan we propose will be adopted. Perhaps another dreadful conflict is to be sustained. If, to please the people, we offer what we ourselves disapprove, how can we afterward defend our work? Let us raise a standard to which the wise and the honest can repair; the event is in the hand of God.”

Some of the 55 took no real part in framing the Constitution, and some were obstructionists. Their objections may have exercised a wholesome influence on the convention, but added much to the cares and perplexities of the greater men who assumed the responsibility and did the work. But whether we take the 39 members who signed the Constitution, or the 51 who took part in the debates, or the 55 who composed the convention, the number seems perilously small to be entrusted with the titanic task of founding for all time a great and growing and intensely active nation. Edmund Randolph, speaking of the time when the Articles of Confederation were framed, apologetically called it “the then infancy of the science of constitutions and of confederacies.” He might have said the same of the moment at which he was addressing the convention. Very little did the world then know of the science of constitutions or confederacies! He well summed up the new and added difficulties which confronted the convention, and which it must meet and overcome:

> The inefficiency of requisitions was unknown [to the framers of the Confederation] — no commercial discord had arisen among any States — no rebellion had appeared, as in Massachusetts — foreign debts had not become urgent — the havoc of the paper money had not been foreseen — treaties had not been violated; and perhaps nothing better could be obtained, from the jealousy of the States with regard to their sovereignty.

There were other difficulties which Randolph, like a tactful statesman, left unnoticed. At one end of the line of financial troubles Rhode Island stood intent on her great scheme of making fiat paper money the equivalent of gold and silver by imprisoning the citizen who charged more for a commodity in the one kind of money than in the other. At the other end of the line stood New York, with the greatest custom-house of the country, her chief source of revenue, which she would be called upon to surrender to the new Federal government as a part of the price she must pay for coming within the sovereignty of the Constitution. Virginia owned a vast territory which she must cede that it might become the public lands of the United States. Even in the greatness and authority of the men who composed the convention there were dangers and impediments. Three of the greatest proposed things would have defeated the great work: Franklin, the wisest member of the convention, proposed that the legislative power be vested in a single house, which would have been substantially the House of Representatives; Hamilton, the brilliant genius of the convention, advocated a government of which the President and the senators should hold office during good behavior, that is, for life; Madison, the most sagacious statesman in the convention, would have cast the responsibility of legislation on the judiciary by lodging a veto power in the Supreme Court. Any one of these provisions would have wrecked the Constitution before it was adopted; and any one of them, if it had been adopted, would have given us a government essentially different from that which we possess.

There is still another extraordinary fact connected with the framing of the Constitution which has received little if any attention, and substantially no comment. In the order of philosophical research the first subject of investigation would be the means or process by which the framers worked. A true philosopher, contemplating the clearness and conciseness of the Constitution, the masterly handling of the chief elements of the future government, the wonderful adaptation of insufficient means to a glorious end, would instantly exclaim, “Such a work is not born of the human mind completed! What was the secret process by which these great inventors attained their grand result”? And the philosopher would find, as he suspected, that even as the Constitution stands alone in the records of constructive statesmanship, so do the means and methods by which the convention did its work. It speaks badly for the century that none of the lesser conventions which have assembled frequently to experiment with State constitutions has done its work in the same way. In a word, there is nothing which equals the Constitution; there is nothing which approaches the patient, painstaking workmanship of the great convention.

At the beginning, propositions for consideration and discussion were tentatively placed before the convention in an *abstract* form. These propositions were embodied in 15 resolutions, which were immediately referred to the Committee of the Whole. They were taken up one by one, and considered and discussed and amended or rejected or adopted or postponed for later consideration. The abstract of a part of a single day's proceedings will give a clear idea of the way in which the convention worked:

Tuesday, June 5. Mr. Randolph's *ninth* proposition—*The national judiciary to be chosen by the national legislature* — Disagreed to — *To hold office during good behavior and to receive a fixed compensation* — Agreed to — *To have jurisdiction over offenses at sea, captures, cases of foreigners and citizens of different States, of national revenue, impeachment of national officers, and questions of national peace and harmony* — Postponed.

At the end of two weeks of such consideration and discussion (13 June), the Committee of the Whole reported the conclusions which had so far been reached in the form of 19 resolutions. But everything was still abstract and tentative. No line of the Constitution had yet been written; no provision had yet been agreed upon. The 19 resolutions in like manner were taken up, one by one, and in like manner considered and discussed and amended or rejected or adopted or postponed. Other propositions coming from other sources were also considered; and so the work went on until 26 July, when the conclusions of the convention were referred to the Committee of Detail, and the work of reducing the abstract to the concrete began. The convention then adjourned to 6 August, to enable the committee to "prepare and report the Constitution."

On 6 August the Committee of Detail reported and furnished every member with a printed copy of the proposed Constitution. Again the work of consideration began, and went on as before, section by section, line by line. Vexed questions were referred to special committees,—composed of one member from each State,—amendments were offered, changes were made, the Committee on Detail incorporated additional matters in their draught, until, on 8 September, the work of construction stopped. But not even then did the labors of the convention cease. On that day a committee was appointed, "by ballot, to revise the style of, and arrange, the articles which had been agreed to." This committee was afterward known as the Committee of Style. It reported on 12 September, and the work of revision again went on until Saturday, the 15th. On Monday, the 17th, the end was reached, and the members of the convention signed the Constitution. Well might Franklin exclaim in his farewell words to the convention: "It astonishes me, sir, to find the system approaching so near to perfection as it does!" He had been overruled more than once in the convention; provisions which he had proposed had been rejected; provisions which he had opposed had been retained; but he was a great man and saw that a great work had been accomplished.

This article should treat of the Constitutional changes of the century. But the extraordinary fact is that from the framers' point of view there has been, with one trivial exception, absolutely no change in the Constitution of the United States. "Are there not 15 amendments," it will be asked, and "do not the presidential electors vote for a President and Vice-president in a different way, and is there not an unwritten change in the Constitution by virtue of which the selection of Presidents has passed directly to the people, acting through their political national conventions?" All these questions may be answered generally in the affirmative; and yet the fact remains that from the framers' point of view there has been, with one trivial exception, absolutely no change in the Constitution of the United States.

The work of the great convention was the making of a government; and the government which the framers made has remained absolutely unchanged. Madison, who was a wary as well as sagacious statesman, carried the first 10 amendments through the first Congress at the first session to assuage public excitement and strengthen the new government and close the mouths of those who railed against it. He introduced into the 10th amendment a rule of construction which would not have been adopted by the convention, a clause which politically has made much mischief during these 100 years, but which under the necessities of judicial construction has amounted to nothing, namely, that powers not delegated or prohibited by the Constitution "are reserved to the States respectively or to the people." The other provisions of the 10 amendments are little more than quotations from the Bill of Rights. The Constitution contained but few such declarations: that the writ of habeas corpus shall not be suspended; that no bill of attainder or *ex post facto* law shall be passed; that the trial of all crimes shall be by jury; that such trials shall be in the State where the crime was committed; that no attainder of treason shall work corruption of blood or forfeiture except during the life of the person attainted. The 10 amendments declare that Congress shall make no law respecting an establishment of religion or prohibiting the free exercise thereof, or abridge the freedom of speech, or the right of the people peacefully to assemble and petition the government for a redress of grievances, etc. (Article 1). They provide that no person shall be compelled to be a witness against himself, nor be deprived of life, liberty or property without due process of law; nor shall private property be taken for public use without just compensation, etc. (Article 5). These are great principles and noble sentiments, but their efficacy depends upon the rectitude of the government and the vigor and integrity of the people. No Congress would ever have dared to "make a law respecting an establishment of religion," though there had been no Constitutional prohibition; and many an unfortunate citizen has lived and died with his claim for property taken for public use still unpaid, notwithstanding the Constitutional guaranty of "just compensation." In a word, the 10 amendments served their temporary purpose; they have doubtless warned off Congress occasionally when in the heedlessness of the short session or in the heat of political excitement a legislative wrong might otherwise have been done; they have in a few instances secured the individual citizen, judicially, in his natural right to life, liberty or property; they continue to be a standing moral restraint upon the legislative and executive branches of the government; and they form a noble decalogue of great principles to be kept before the eyes of all American citizens; but, nevertheless, the judicial records of the century show that the government which the framers of the Constitution established would have moved on just as it has done, if these 10 amendments had never been proposed. The conscience and intelligence of the country have been the real safeguards of the citizen against injustice and oppression.

The Eleventh Amendment was caused by the extreme ground taken by the early Supreme Court in Chisholm v. Georgia, 2 Dall. 419, and the incipient rebellion of that State. Its purpose was to overrule that decision and to exempt a State from suit by a citizen. If Marshall had been upon the bench the decision would never have been made; and, singularly, it was overruled by the same court a hundred years afterward (Hans v. Louisiana, 134

U. S. 1). The Thirteenth, Fourteenth and Fifteenth Amendments grew out of the Civil War. They abolished slavery; they impose restraints upon State governments; they confer on some persons constitutional rights; they guarantee certain rights, privileges and immunities to citizens and persons; and they contain some provisions relating to representation in Congress. Much litigation has been caused by them; some statutes have been held constitutional and some unconstitutional; a larger proportion of representation has fallen to the Southern States; the guaranty given to all citizens of the right to vote without regard to «race, color or previous condition of servitude» is not absolutely effective, and the government of the United States moves on precisely as it did before.

It has been said herein that from the point of view of the framers of the Constitution their work has been changed in only one trifling particular. That change relates to election of the President, and was effected by the Twelfth Amendment. Under the Constitution as it originally stood each elector voted for two persons for President. He who should have the greatest number of votes would become President; he who might come next would be Vice-President. Under this provision, Mr. Lincoln, in 1861, would have become President, and Mr. Seward Vice-President. That is to say, the Republican electors, following the direction of their party, as expressed by the national convention, would have cast all their votes for Mr. Lincoln, and all but one for Mr. Seward. The purpose of the framers was a wise one: to secure for the country the two strongest statesmen of the party constituting for the time being the majority of the people, to fill the offices of President and Vice-President. No better plan could have been devised for obtaining a strong executive. We see a weak and modified application of the principle in national conventions when the defeated «wing of the party» is placated by being allowed to designate the candidate for Vice-President. But in 1801 there had been a tie, whereby the electors had failed to elect, and the election had gone into the House. If it had not been for that mishap, the Twelfth Amendment would not now exist; and if the original system had survived until the time of rapid communication by railroad and telegraph and better party organization, it is safe to say that it would now be in unquestioned operation. Political conventions would long ago have adopted its leading principle, and the struggle would have been as to which of the two strongest candidates should be first or second upon the ticket. The system would have given greater dignity to the office of Vice-President, and would have brought the possible importance of that office always before the eyes of the citizen. But whether we think well or ill of the original method, one thing is certain, that the only change made by the Twelfth Amendment is a trivial one of administrative detail. After all the changes this country has passed through in the last hundred years — changes in civilization, of territory, of population, of ideas, education and public convictions, and individual life — changes such as the world has never witnessed in one country or in one century, the only change made in the Constitution has been the paltry one of having the electoral vote cast in one form instead of in another.

The unwritten amendment of the Constitution, as it has been called, also relates to the selection of the President. It is said by some of the commentators, and indeed it is now generally believed, that the electoral colleges were intended to be «deliberative bodies.» In one sense this is true — in the legal sense. The electors are not ministerial or administrative officers; they do not perform a specific work in a way determined by higher official authority; in legal contemplation the responsibility of their action rests upon themselves. But the framers of the Constitution never supposed that the electors would disregard the political pledges upon which they were chosen, or that the American people, either directly or through their State legislatures, would blindly choose electors to evolve a President out of their inner consciousness. On the contrary, they contemplated the successful candidates receiving the votes of «a majority of the whole number of electors,» and they required the electors to vote «in their respective States,» and to vote on the same day. If they had framed a provision requiring all of the electors to convene at the seat of the government in one body, and there in their own way and time proceed to choose a President, there would be good reason for saying that actual deliberation was intended; but they did not give to the electors one single power or attribute by virtue of which they could deliberate.

That very thing was attempted and the attempt failed. The question before the convention was, in effect: «Where shall the deliberative power to choose the President be vested when the formal casting and counting of the electoral vote fails to elect?» The answering propositions were, «In the Senate,» or «In the House of Representatives.» Then Spaight, of North Carolina, said that «he would prefer their [the electors] meeting altogether [all together] and *deciding finally*»; and he moved «*that the electors meet at the seat of the general government*»; and all of the States except North Carolina voted against it. The evidence is therefore both negative and positive — the convention did not invest the electors with the necessary powers and means for deliberation, and positively refused to do so; and refusal is conclusive of non-intent.

The idea that it was ever intended that the electors should nominate the candidate for whom they themselves should vote is a myth which has been unthinkingly reiterated by most eminent writers, but which does not rest upon a single fact. Nothing perplexed the convention more than the subject of the executive. Plan after plan was weighed and found wanting. The electoral system was late in coming to the front, and was the solvent of many difficulties. Hamilton early foresaw the inevitable, and proposed that «the selection be made by electors chosen by the people.» Madison, later, said that the option before the convention «lay between an appointment by electors chosen by the people and an immediate appointment by the people»; and he at the same time said that «the electors would be chosen *for the occasion*, would meet *at once*, and proceed *immediately* to an appointment.» It was as well understood then as it is now that they would but register the decree of the political power which appointed them. The internal evidence of intent is even more conclusive. He who supposes that the framers intended *that 13 different bodies should convene in 13 different places at one time for one object and for one day, and that object the selection of the executive of a nation*, confesses a most superficial knowledge of the greatest constructive statesmen of their century and of the great work which they deliberately planned and built.

And what better could the framers of the Constitution have done? Wilson, who proposed «an election by the people,» was «almost unwilling to declare the mode which he wished to take place, being apprehensive that it might appear chimerical.» Gerry, «who liked the principle,» «thought the community not yet ripe»; he «was for waiting till the people should feel more the necessity of it.» Gouverneur Morris admitted «that difficulties attended this mode,» but thought that they would be «found superable.» Madison liked an election by the people best, but acknowledged «the disadvantage this would throw on the smaller States.» Ellsworth declared «the objection drawn from the different sizes of the States unanswerable.»

It has been a fashion of late to speak of the electoral system as curious machinery which may give rise to serious complications; but viewed amid the difficulties and conditions and limitations of 1787, there is no stroke of practical statesmanship in the Constitution more wise and ingenious. The choosing of candidates soon drifted into Congress; with the coming of the steamboat and the railroad it passed from the congressional caucus to national conventions; and yet, notwithstanding these radical changes of usage, the expansion of territory, the multiplication of States, and the unscrupulousness of political partisanship, there have been no more mishaps than are incident to any system of human device.

To foretell the future of the Constitution is to foretell the future of the American people. They will change before it is changed. As with Washington and Lincoln, the more we know of them the better they appear; so of the Constitution, the more we contemplate its trials the better it appears adapted to our national needs. With the growth of knowledge there has been a growth of reverence. The people will experiment with State constitutions and tear them up and experiment again, but when it comes to the Constitution — the great Constitution — there is a sturdy sentiment of «hands off,» and that sentiment is incomparably stronger now than it was at the beginning of the century. Judicial construction has moved backward rather than forward, and where Marshall left it, it stands, substantially, to-day.

The amendatory provision of the Constitution is an unbarred door which may be opened at any time. It was wise and prudent of the framers to leave it thus unlocked. But he who tries to swing open that door will find two things of which he did not reckon: first, a *vis inertia* in the ignorance and indifference of congressmen — in their doubts whether the amendments will be popular — in their absorption in lesser things; and, second, that there is always some one on the other side pressing back the door.

Charles C. Nott,
Late Chief Justice Court of Claims.

CONSTITUTION, The, or OLD IRONSIDES (from the slightness of the injury her hull received in the fight with the *Guerrière*), one of the most famous vessels of the American navy, now fixed in Boston harbor. She was a 44-gun frigate of 1,576 tons; one of the six war vessels ordered by Congress early in 1794, on account of the Algerian piracies. (See Barbary Powers, U. S. Wars and Treaties with the). During the wars against Tripoli she was Preble's flagship and in 1805 took part in three of the five bombardments off Tripoli.

When the War of 1812 broke out Hull started to join the New York squadron with her, 12 July; was cut off by a British squadron, including the *Guerrière*, but in a wonderful chase of three nights and two days outmanœuvred and escaped it. On 19 August, off Cape Race, she ran into and fought a battle with the *Guerrière*, a somewhat weaker English frigate which she left a total wreck after an engagement of 25 minutes, the English losing 79 of their crew, the Americans 14. The *Guerrière* was sinking and could not be towed into port; she was therefore blown up. Hull sailed into Boston with his prisoners, to such an ovation as few men have ever earned in so short a time. In less than 25 minutes of actual fighting he had lifted the despised American navy and nation to an equality with the proudest of the world; and drew from Great Britain such an explosion of rage and humiliation as it has never known before or since. Later the *Constitution* was made Bainbridge's flagship for a cruise against English commerce in the East Indies. On 29 Dec. 1812 it encountered the *Java*, Captain Lambert, off the coast of Brazil, and at 2.10 P.M. joined action. The *Constitution* had 54 guns, with 787 pounds of metal; the *Java* 47, with 568 pounds. The crews were 480 and 426. One of the fiercest of naval battles ensued for nearly two hours, in which the *Constitution's* wheel was shot away at the outset, making its navigation difficult, and the English vessel was the better sailer anyway. But the American gunnery was incomparably more intelligent and improved every opportunity for raking broadsides, while the British did not. As soon as the *Constitution* came to close quarters, she inflicted ruinous damage and frightful slaughter. The *Constitution* was taken into Boston for repairs; but before they were completed, Boston was closely blockaded, and she did not escape till New Year's Day 1814, under Capt. Charles Stewart. See United States, War of 1812.

In a cruise to the West Indies, Captain Stewart captured four prizes, with 24 guns and 76 men; one of them was the 14-gun schooner *Picton*. Again blockaded by a powerful British squadron she did not escape until 17 Dec. 1814. In 1815 she encountered two British vessels, the *Cyane* and the *Levant*.

The *Cyane* struck; the *Levant* temporarily escaped, but was overhauled by the *Constitution*, and surrendered also. The two ships had lost 35 killed and 42 wounded; the *Constitution*, 4 killed and 10 wounded. Cut off by a powerful British squadron at a neutral port whose neutrality the English treated with utter contempt, the *Constitution* and *Cyane* succeeded by fine seamanship in escaping, but the *Levant* was recaptured. In 1830 she was reported unseaworthy, and condemned to be broken up, but

Oliver Wendell Holmes published in the Boston *Advertiser* his thrilling poem 'Old Ironsides,' and the public clamor excited by it saved the noble vessel, which was rebuilt and again put in service in 1833. In 1855 she was laid up at the Portsmouth Navy Yard, but used sometimes as a training-ship; in 1877 was again partially rebuilt, and took her last trip across the Atlantic the next year. In 1897 she was roofed in at the Boston Navy Yard, and has since been used as a barrack ship, etc. Consult Hollis, 'The Frigate Constitution' (1900); Maclay, 'History of the United States Navy' (Vol I, 2d ed., 1898); Adams, Henry, 'History of the United States' (Vols. VI, VII, IX, 1900–01); Roosevelt, 'Naval War of 1812' (1882); Barnes, 'Naval Actions of the War of 1812' (1896).

CONSTITUTION OF MATTER. See Gases, Kinetic Theory of; Matter; Molecular Theory.

CONSTITUTION OF THE UNITED STATES, the governing instrument of the United States of America, adopted in 1787, when it took the place of the Articles of Confederation. (For details of its adoption see Constitution, Framing of The). Political discussion of the time played a much greater part in the compromises of this instrument than its provisions in turn exerted on political history in the following period, which to a surprising degree may be attached to only two clauses of the instrument and to these two simply because of their vagueness, and their mutually contradictory nature. Section 8 (18) in defining the powers of Congress adds the blanket provision of power, «to make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the government of the United States, or in any department or officer thereof.» The second historic clause occurs in the Amendments, where Article X reads: «The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.» The former is the famous elastic clause. In this accommodating provision interpreted radically, or conservatively, in the light of the Tenth Amendment all shades of political theory find proof-texts for their peculiar doctrines. So immediately upon the formation of the new government two political parties arose, the Democratic-Republican party, strict constructionists of the elastic clause, who limited the powers of Congress to the minimum and exalted State rights to the maximum, and the Federalist party in favor of a highly centralized government doing everything possible for and in the States. Around this fundamental difference may be grouped the great political questions up to and culminating in the Civil War, and to a less degree recent political discussions are based upon the same variance in interpretation of the Constitution, although neither party now holds to the strict construction theory as it was set forth by the early opponents of the Federalists. This change has been brought about very largely by practical experience of affairs, it being well known that the foremost strict constructionists who have come to the presidential chair were forced by the exigencies of administration to a broader exposition of the clause. This was notably the case in the administrations of Jefferson and of his immediate lieutenants and successors.

The text of the Constitution follows:

CONSTITUTION OF THE UNITED STATES

We the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.

ARTICLE I

Section 1. All legislative powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

Section 2. 1 The House of Representatives shall be composed of members chosen every second year by the people of the several States, and the electors in each State shall have the qualifications requisite for electors of the most numerous branch of the State legislature.

2 No person shall be a representative who shall not have attained to the age of twenty-five years, and been seven years a citizen of the United States, and who shall not, when elected, be an inhabitant of that State in which he shall be chosen.

3 Representatives and direct taxes shall be apportioned among the several States which may be included within this Union, according to their respective numbers, which shall be determined by adding to the whole number of free persons, including those bound to service for a term of years, and excluding Indians not taxed, three fifths of all other persons. The actual enumeration shall be made within three years after the first meeting of the Congress of the United States, and within every subsequent term of ten years, in such manner as they shall by law direct. The number of representatives shall not exceed one for every thirty thousand, but each State shall have at least one representative; and until such enumeration shall be made, the State of New Hampshire shall be entitled to choose three, Massachusetts eight, Rhode Island and Providence Plantations one, Connecticut five, New York six, New Jersey four, Pennsylvania eight, Delaware one, Maryland six, Virginia ten, North Carolina five, South Carolina five, and Georgia three.

4 When vacancies happen in the representation from any State, the executive authority thereof shall issue writs of election to fill such vacancies.

5 The House of Representatives shall choose their speaker and other officers, and shall have the sole power of impeachment.

Section 3. 1 The Senate of the United States shall be composed of two senators from each State, chosen by the legislature thereof for six years; and each senator shall have one vote.

2 Immediately after they shall be assembled in consequence of the first election, they shall be divided as equally as may be into three classes. The seats of the senators of the first class shall be vacated at the expiration of the second year, of the second class at the expiration of the fourth year, and of the third class at the expiration of the sixth year, so that one third may be chosen every second year; and if vacancies happen by resignation, or otherwise, during the recess of the legislature of any State, the executive thereof may make temporary appointments until the next meeting of the legislature, which shall then fill such vacancies.

3 No person shall be a senator who shall not have attained to the age of thirty years, and been nine years a citizen of the United States, and who shall not, when elected, be an inhabitant of that State for which he shall be chosen.

4 The Vice President of the United States shall be President of the Senate, but shall have no vote, unless they be equally divided.

5 The Senate shall choose their other officers, and also a president *pro tempore*, in the absence of the Vice President, or when he shall exercise the office of President of the United States.

6 The Senate shall have the sole power to try all impeachments. When sitting for that purpose, they shall be on oath or affirmation. When the President of the United States is tried, the chief justice shall preside: and no person shall be convicted without the concurrence of two thirds of the members present.

7 Judgment in cases of impeachment shall not extend further than to removal from office, and disqualification to hold and enjoy any office of honor, trust or profit under the United States: but the party convicted shall nevertheless be liable and subject to indictment, trial, judgment and punishment, according to law.

Section 4. 1 The times, places, and manner of holding elections for senators and representatives, shall be prescribed in each State by the legislature thereof; but the Congress may at any time by law make or alter such regulations, except as to the places of choosing senators.

2 The Congress shall assemble at least once in every year, and such meeting shall be on the first Monday in December, unless they shall by law appoint a different day.

SECTION 5. 1 Each House shall be the judge of the elections, returns and qualifications of its own members, and a majority of each shall constitute a quorum to do business; but a smaller number may adjourn from day to day, and may be authorized to compel the attendance of absent members, in such manner, and under such penalties as each House may provide.

2 Each House may determine the rules of its proceedings, punish its members for disorderly behavior, and, with the concurrence of two thirds, expel a member.

3 Each House shall keep a journal of its proceedings, and from time to time publish the same, excepting such parts as may in their judgment require secrecy; and the yeas and nays of the members of either House on any question shall, at the desire of one fifth of those present, be entered on the journal.

4 Neither House, during the session of Congress, shall, without the consent of the other, adjourn for more than three days, nor to any other place than that in which the two Houses shall be sitting.

SECTION 6. 1 The senators and representatives shall receive a compensation for their services, to be ascertained by law, and paid out of the Treasury of the United States. They shall in all cases, except treason, felony and breach of the peace, be privileged from arrest during their attendance at the session of their respective Houses, and in going to and returning from the same; and for any speech or debate in either House, they shall not be questioned in any other place.

2 No senator or representative shall, during the time for which he was elected, be appointed to any civil office under the authority of the United States, which shall have been created, or the emoluments whereof shall have been increased during such time; and no person holding any office under the United States shall be a member of either House during his continuance in office.

SECTION 7. 1 All bills for raising revenue shall originate in the House of Representatives; but the Senate may propose or concur with amendments as on other bills.

2 Every bill which shall have passed the House of Representatives, and the Senate, shall, before it become a law, be presented to the President of the United States; if he approve he shall sign it, but if not he shall return it, with his objections to that House in which it shall have originated, who shall enter the objections at large on their journal, and proceed to reconsider it. If after such reconsideration two thirds of that House shall agree to pass the bill, it shall be sent, together with the objections, to the other House, by which it shall likewise be reconsidered, and if approved by two thirds of that House, it shall become a law. But in all such cases the votes of both Houses shall be determined by yeas and nays, and the names of the persons voting for and against the bill shall be entered on the journal of each House respectivley. If any bill shall not be returned by the President within ten days (Sundays excepted) after it shall have been presented to him, the same shall be a law, in like manner as if he had signed it, unless the Congress by their adjournment prevent its return, in which case it shall not be a law.

3 Every order, resolution, or vote to which the concurrence of the Senate and House of Representatives may be necessary (except on a question of adjournment) shall be presented to the President of the United States; and before the same shall take effect, shall be approved by him, or being disapproved by him, shall be repassed by two thirds of the Senate and House of Representatives, according to the rules and limitations prescribed in the case of a bill.

SECTION 8. 1 The Congress shall have power to lay and collect taxes, duties, imposts and excises, to pay the debts and provide for the common defense and general welfare of the United States; but all duties, imposts and excises shall be uniform throughout the United States.

2 To borrow money on the credit of the United States;

3 To regulate commerce with foreign nations, and among the several States, and with the Indian tribes;

4 To establish an uniform rule of naturalization, and uniform laws on the subject of bankruptcies throughout the United States;

5 To coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures;

6 To provide for the punishment of counterfeiting the securities and current coin of the United States;

7 To establish post offices and post roads;

8 To promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries;

9 To constitute tribunals inferior to the Supreme Court;

10 To define and punish piracies and felonies committed on the high seas, and offenses against the law of nations;

11 To declare war, grant letters of marque and reprisal, and make rules concerning captures on land and water;

12 To raise and support armies, but no appropriation of money to that use shall be for a longer term than two years;

13 To provide and maintain a navy;

14 To make rules for the government and regulation of the land and naval forces;

15 To provide for calling forth the militia to execute the laws of the Union, suppress insurrections and repel invasions;

16 To provide for organizing, arming, and disciplining the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the States respectively the appointment of the officers, and the authority of training the militia according to the discipline prescribed by Congress;

17 To exercise exclusive legislation in all cases whatsoever over such district (not exceeding ten miles square) as may, by cession of particular States and the acceptance of Congress, become the seat of the government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the State in which the same shall be, for the erection of forts, magazines, arsenals, dockyards, and other needful buildings; and

18 To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the government of the United States, or in any department or officer thereof.

SECTION 9. 1 The migration or importation of such persons as any of the States now existing shall think proper to admit, shall not be prohibited by the Congress prior to the year one thousand eight hundred and eight, but a tax or duty may be imposed on such importation, not exceeding ten dollars for each person.

2 The privilege of the writ of *habeas corpus* shall not be suspended, unless when in cases of rebellion or invasion the public safety may require it.

3 No bill of attainder or *ex post facto* law shall be passed.

4 No capitation, or other direct, tax shall be laid, unless in proportion to the census or enumeration hereinbefore directed to be taken.

5 No tax or duty shall be laid on articles exported from any State.

6 No preference shall be given by any regulation of commerce or revenue to the ports of one State over those of another; nor shall vessels bound to, or from, one State be obliged to enter, clear, or pay duties in another.

7 No money shall be drawn from the treasury, but in consequence of appropriations made by law; and a regular statement and account of the receipts and expenditures of all public money shall be published from time to time.

8 No title of nobility shall be granted by the United States; and no person holding any office of profit or trust under them, shall, without the consent of the Congress, accept of any present, emolument, office, or title, of any kind whatever, from any king, prince, or foreign State.

SECTION 10. 1 No State shall enter into any treaty, alliance, or confederation; grant letters of marque and reprisal; coin money; emit bills of credit; make anything but gold and silver coin a tender in payment of debts; pass any bill of attainder, *ex post facto* law, or law impairing the obligation of contracts, or grant any title of nobility.

2 No State shall, without the consent of the Congress, lay any imposts or duties on imports or exports, except what may be absolutely necessary for executing its inspection laws; and the net produce of all duties and imposts laid by any State on imports or exports, shall be for the use of the treasury of the United States; and all such laws shall be subject to the revision and control of the Congress.

3 No State shall, without the consent of Congress, lay any duty of tonnage, keep troops, or ships of war in time of peace, enter into any agreement or compact with another State, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit of delay.

ARTICLE II

SECTION 1. 1 The executive power shall be vested in a President of the United States of America. He shall hold his office during the term of four years, and, together with the Vice President, chosen for the same term, be elected, as follows:

2 Each State shall appoint, in such manner as the legislature thereof may direct, a number of electors, equal to the whose number of senators and representatives to which the State may be entitled in the Congress: but no senator or representative, or person holding an office of trust or profit under the United States, shall be appointed an elector.

3 The electors shall meet in their respective States, and vote by ballot for two persons, of whom one at least shall not be an inhabitant of the same State with themselves. And they shall make a list of all the persons voted for, and of the number of votes for each; which list they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the president of the Senate. The president of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates. and the votes shall then be counted. The person having the

greatest number of votes shall be the President, if such number be a majority of the whole number of electors appointed; and if there be more than one who have such majority, and have an equal number of votes, then the House of Representatives shall immediately choose by ballot one of them for President; and if no person have a majority, then from the five highest on the list the said house shall in like manner choose the President. But in choosing the President, the votes shall be taken by States, the representation from each State having one vote; a quorum for this purpose shall consist of a member or members from two thirds of the States, and a majority of all the States shall be necessary to a choice. In every case, after the choice of the President, the person having the greatest number of votes of the electors shall be the Vice President. But if there should remain two or more who have equal votes, the Senate shall choose from them by ballot the Vice President. (This clause was changed by the Twelfth Amendment).

4 The Congress may determine the times of choosing the electors, and the day on which they shall give their votes; which day shall be the same throughout the United States.

5 No person except a natural born citizen, or a citizen of the United States, at the time of the adoption of this Constitution, shall be eligible to the office of President; neither shall any person be eligible to that office who shall not have attained to the age of thirty-five years, and been fourteen years a resident within the United States.

6 In case of the removal of the President from office, or of his death, resignation, or inability to discharge the powers and duties of the said office, the same shall devolve on the Vice President, and the Congress may by law provide for the case of removal, death, resignation, or inability, both of the President and Vice President, declaring what officer shall then act as President, and such officer shall act accordingly, until the disability be removed, or a President shall be elected.

7 The President shall, at stated times, receive for his services a compensation, which shall neither be increased nor diminished during the period for which he shall have been elected, and he shall not receive within that period any other emolument from the United States, or any of them.

8 Before he enter on the execution of his office, he shall take the following oath or affirmation: — "I do solemnly swear (or affirm) that I will faithfully execute the office of President of the United States, and will to the best of my ability, preserve, protect and defend the Constitution of the United States."

SECTION 2. 1 The President shall be commander in chief of the army and navy of the United States, and of the militia of the several States, when called into the actual service of the United States; he may require the opinion, in writing, of the principal officer in each of the executive departments, upon any subject relating to the duties of their respective offices, and he shall have power to grant reprieves and pardons for offenses against the United States, except in cases of impeachment.

2 He shall have power, by and with the advice and consent of the Senate, to make treaties, provided two thirds of the senators present concur; and he shall nominate, and by and with the advice and consent of the Senate, shall appoint ambassadors, other public ministers and consuls, judges of the Supreme Court, and all other officers of the United States, whose appointments are not herein otherwise provided for, and which shall be established by law: but the Congress may by law vest the appointment of such inferior officers, as they think proper, in the President alone, in the courts of law, or in the heads of departments.

3 The President shall have power to fill up all vacancies that may happen during the recess of the Senate, by granting commissions which shall expire at the end of their next session.

SECTION 3. He shall from time to time give to the Congress information of the state of the Union, and recommend to their consideration such measures as he shall judge necessary and expedient; he may, on extraordinary occasions, convene both Houses, or either of them, and in case of disagreement between them with respect to the time of adjournment, he may adjourn them to such time as he shall think proper; he shall receive ambassadors and other public ministers; he shall take care that the laws be faithfully executed, and shall commission all the officers of the United States.

SECTION 4. The President, Vice President, and all civil officers of the United States, shall be removed from office on impeachment for, and conviction of, treason, bribery, or other high crimes and misdemeanors.

ARTICLE III

SECTION 1. The judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain and establish. The judges, both of the Supreme and inferior courts, shall hold their offices during good behavior, and shall, at stated times, receive for their services, a compensation which shall not be diminished during their continuance in office.

SECTION 2. 1 The Judicial power shall extend to all cases, in law and equity, arising under this Constitution, the laws of the United States, and treaties made, or which shall be made, under their authority; — to all cases affecting ambassadors, other public ministers and consuls; — to all cases of admiralty and maritime jurisdiction; — to controversies to which the United States shall be a party; — to controversies between two or more States; — between a State and citizens of another State; — between citizens of different States,— between citizens of the same State claiming lands under grants of different States, and between a State, or the citizens thereof, and foreign States, citizens or subjects.

2 In all cases affecting ambassadors, other public ministers and consuls, and those in which a State shall be party, the Supreme Court shall have original jurisdiction. In all the other cases before mentioned, the Supreme Court shall have appellate jurisdiction, both as to law and fact, with such exceptions, and under such regulations as the Congress shall make.

3 The trial of all crimes, except in cases of impeachment, shall be by jury; and such trial shall be held in the State where the said crimes shall have been committed; but when not committed within any State, the trial shall be at such place or places as the Congress may by law have directed.

SECTION 3. 1. Treason against the United States, shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act, or on confession in open court.

2 The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood or forfeiture except during the life of the person attainted.

ARTICLE IV

SECTION 1. Full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State. And the Congress may by general laws prescribe the manner in which such acts, records and proceedings shall be proved, and the effect thereof.

SECTION 2. 1 The citizens of each State shall be entitled to all privileges and immunities of citizens in the several States.

2 A person charged in any State with treason, felony, or other crime, who shall flee from justice, and be found in another State, shall on demand of the executive authority of the State from which he fled, be delivered up to be removed to the State having jurisdiction of the crime.

3 No person held to service or labor in one State, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labor may be due.

SECTION 3. 1 New States may be admitted by the Congress into this Union; but no new States shall be formed or erected within the jurisdiction of any other State; nor any State be formed by the junction of two or more States, or parts of States, without the consent of the legislatures of the States concerned as well as of the Congress.

2 The Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States; and nothing in this Constitution shall be so construed as to prejudice any claims of the United States, or of any particular State.

SECTION 4. The United States shall guarantee to every State in this Union a republican form of government, and shall protect each of them against invasion; and on application of the legislature, or of the executive (when the legislature cannot be convened) against domestic violence.

ARTICLE V

The Congress, whenever two thirds of both Houses shall deem it necessary, shall propose amendments to this Constitution, or, on the application of the legislature of two thirds of the several States, shall call a convention for proposing amendments, which, in either case, shall be valid to all intents and purposes, as part of this Constitution, when ratified by the legislatures of three fourths of the several States, or by conventions in three fourths thereof, as the one or the other mode of ratification may be proposed by the Congress: Provided that no amendment which may be made prior to the year one thousand eight hundred and eight shall in any manner affect the first and fourth clauses in the ninth section of the first article; and that no State, without its consent, shall be deprived of its equal suffrage in the Senate.

ARTICLE VI

1 All debts contracted and engagements entered into, before the adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

2 This Constitution, and the laws of the United States which shall be made in pursuance thereof; and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land; and the judges in every State shall be bound thereby, anything in the Constitution or laws of any State to the contrary notwithstanding.

3 The senators and representatives before mentioned, and the members of the several State legislatures, and all executive and judicial officers, both of the United States, and of the several States, shall be bound by oath or affirmation to support this Constitution; but no religious test shall ever be required as a qualification to any office or public trust under the United States.

ARTICLE VII

The ratification of the conventions of nine States shall be sufficient for the establishment of this Constitution between the States so ratifying the same.

Done in Convention by the unanimous consent of the States present the seventeenth day of September in the year of our Lord one thousand seven hundred and eighty-seven, and of the independence of the United States of America the twelfth. In witness whereof we have hereunto subscribed our names,

Go: Washington —
Presidt. and Deputy from Virginia

New Hampshire
John Langdon
Nicholas Gilman

Massachusetts
Nathaniel Gorham
Rufus King

Connecticut
Wm. Saml. Johnson
Roger Sherman

New York
Alexander Hamilton

New Jersey
Wil: Livingston
David Brearley
Wm. Paterson
Jona: Dayton

Pennsylvania
B. Franklin
Thomas Mifflin
Robt. Morris
Geo. Clymer
Thos. Fitzsimons
Jared Ingersoll
James Wilson
Gouv Morris

Delaware
Geo: Read
Gunning Bedford Jun
John Dickinson
Richard Bassett
Jaco: Broom

Maryland
James McHenry
Dan of St. Thos. Jenifer
Danl. Carroll

Virginia
John Blair —
James Madison Jr.

North Carolina
Wm. Blount
Richd. Dobbs Spaight
Hu Williamson

South Carolina
J. Rutledge
Charles Cotesworth Pinckney
Charles Pinckney
Pierce Butler

Georgia
William Few
Abr Baldwin

Attest William Jackson Secretary.

Articles in addition to, and amendment of, the Constitution of the United States of America, proposed by Congress, and ratified by the legislatures of the several States pursuant to the fifth article of the original Constitution.

ARTICLE I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the government for a redress of grievances.

ARTICLE II

A well regulated militia, being necessary to the security of a free State, the right of the people to keep and bear arms, shall not be infringed.

ARTICLE III

No soldier shall, in time of peace be quartered in any house, without the consent of the owner, nor in time of war, but in a manner to be prescribed by law.

ARTICLE IV

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

ARTICLE V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia, when in actual service in time of war or public danger; nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use without just compensation.

ARTICLE VI

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the assistance of counsel for his defense.

ARTICLE VII

In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise reëxamined in any court of the United States, than according to the rules of the common law.

ARTICLE VIII

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

ARTICLE IX

The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people.

ARTICLE X

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

ARTICLE XI

The judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by citizens of another State, or by citizens or subjects of any foreign State.

ARTICLE XII

The electors shall meet in their respective States, and vote by ballot for President and Vice President, one of whom, at least, shall not be an inhabitant of the same State with themselves; they shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice President, and they shall make distinct lists of all persons voted for as President and for all persons voted for as Vice President, and of the number of votes for each, which lists they shall sign and certify, and transmit sealed to the seat of government of the United States, directed to the president of the Senate.—The president of the Senate shall, in presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted;—The person having the greatest number of votes for President shall be the President, if such number be a majority of the whole number of electors appointed; and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as President, the House of Representatives shall choose immediately by ballot, the President. But in choosing the President, the votes shall be taken by States, the representation from each State having one vote; a quorum for this purpose shall consist of a member or members from two thirds of the States, and a majority of all States shall be necessary to a choice. And if the House of Representatives shall not choose a President whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the Vice President shall act as President, as in the case of the death or other constitutional disability of the President. The person having the greatest number of votes as Vice President shall be the Vice President, if such number be a majority of the whole number of electors appointed and if no person have a majority, then from the two highest numbers on the list, the Senate shall choose the Vice President; a quorum for the purpose shall consist of two thirds of the whole number of senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of President shall be eligible to that of Vice President of the United States.

ARTICLE XIII

Section 1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

Section 2. Congress shall have power to enforce this article by appropriate legislation.

ARTICLE XIV

Section 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

Section 2. Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of electors for President and Vice President of the United States, representatives in Congress, the executive and judicial officers of a State, or the members of the legislature thereof, is denied to any of the male inhabitants of such State, being twenty-one years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such State.

Section 3. No person shall be a senator or representative in Congress or elector of President and Vice President, or hold any office, civil or military, under the United States, or under any State, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any State legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may by a vote of two-thirds of each House, remove such disability.

Section 4. The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations and claim shall be held illegal and void.

Section 5. The Congress shall have power to enforce, by appropriate legislation, the provisions of this article.

ARTICLE XV.

Section 1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.

Section 2. The Congress shall have power to enforce this article by appropriate legislation.

ARTICLE XVI

The Congress shall have power to lay and collect taxes on incomes, from whatever source derived, without apportionment among the several States, and without regard to any census or enumerations.

ARTICLE XVII

Section 1. The Senate of the United States shall be composed of two Senators from each State, elected by the people thereof, for six years, and each Senator shall have one vote. The Electors in each State shall have the qualifications requisite for Electors of the most numerous branch of the State Legislatures.

Section 2. When vacancies happen in the representation of any State in the Senate, the Executive authority of such State shall issue writs of election to fill such vacancies, provided that the Legislature of any State may empower the Executive thereof to make temporary appointments until the people fill the vacancies by election as the Legislature may direct.

Section 3. This amendment shall not be so construed as to affect the election or term of any Senator chosen before it becomes valid as part of the Constitution.

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CONSTITUTIONAL AMENDMENTS, History of. As shown in a preceding article (see Constitution, Framing of the), very few of the States liked the Constitution as a form of government at all, and fewer still were satisfied with it as an instrument. North Carolina had refused to ratify without amendments and a "bill of rights" affixed — a declaration of the fundamental rights of human beings to which immense importance was attached by the mass at that time; Massachusetts and New Hampshire ratified with an appended urgent recommendation of certain amendments; New

York first ratified subject to the right to secede if her amendments were not accepted within six years, and finally changed «on condition» to «in full confidence.» The mass of amendments proposed in the first Congress was enormous; 103 from the States themselves, and 42 from minorities in other States, besides long bills of rights from New York and Virginia. Some of them were duplicates, but the total was very great; the House rejected them all and agreed on 17 articles in their place. The Senate cut them down to 12 and both Houses passed them; the first two failed of ratification by the States, the remaining 10 were accepted and went into force 15 Dec. 1791.

The text of the Amendments is to be found with the body of the Constitution.

The First Amendment (Article I) was violated by the government within a few years in the Sedition Act (see Alien and Sedition Acts), and had no effect in accomplishing its defeat, which was effected by a party revolution. Nor has it prevented «gag laws,» or exclusion from the mails of whatever has been thought obnoxious. Public opinion in these respects has been found more efficient than the Constitution.

General warrants were a principal grievance of the British customs laws, a fact which explains Article IV.

«Life *or limb*» in Article V is a curious anachronism; modern laws do not prescribe the rack as a punishment. Probably the drafters of this provision used a current phrase without stopping to analyze its meaning.

The provision of Article VI against changing the venue was doubtless suggested by the attempts to take Americans to England for trial.

The intrepid jumble of possible and impossible dangers of Articles VII–X, inclusive, reminiscences of 17th-century persecutions and 18th-century customs laws, of the times of King John and those of George III, of grievances unthinkable except under foreign rule and of others likely enough under their own, of local provisions and world-wide provisions, is amusingly characteristic of the period and the people; perhaps rather, any period and any people. The Amendments inspired the champions of a strong government with great weariness and disgust; but they are not all anachronisms or idle precautions. The Tenth especially (added by Massachusetts) has in practice restrained the action of the government greatly, especially in guiding the construction of the Supreme Court; and certain provisions of the Fifth, Sixth and Seventh have been great public safeguards, by no means out of date even yet.

See Chisholm v. Georgia, for the circumstances under which the Eleventh Amendment, put in force 8 Jan. 1798, was passed. Maryland had been sued by a private citizen, and submitted; Georgia was sued, refused to plead and threatened with death any one who served a writ in the suit; and she and Virginia pressed through an amendment forbidding such suits by individuals against States, but not vice-versa.

The gist of Article XII is the naming of the candidates for President and Vice-President separately; the lack of which provision brought about a discreditable intrigue, and results political and personal by no means forgotten. (See Electoral System; Jefferson-Burr Imbroglio). Before this, the highest candidate was President and the next highest Vice-President; but now came an election which showed not merely the possibility of a tie, but the certainty of one, between the two candidates of the same party from mere party loyalty. Yet plain as this seems, the Amendment failed in the first Congress where it was introduced, passed the House 12 Dec. 1803, only by the Speaker's casting vote, was ratified by the bare three-fourths of the States necessary, and declared in force 25 Sept. 1804. New Hampshire, Massachusetts, Connecticut and Delaware (Federalist States), rejected it.

The Emancipation Proclamation had freed only the slaves within the States technically in revolt. In those where the Union forces alone had prevented it, as Maryland, or a powerful minority of Union men plus resolute Union commanders, as Missouri, and generally in the Border States, the slaves were still private property, nearly 1,000,000 in number. Movements to compensate the owners were abortive, partly because the owners would not listen to such proposals; and the Thirteenth Amendment was introduced for entire emancipation without payment. Its phraseology is essentially that of the Ordinance of 1787 (q.v.), repeated in the Missouri Compromise and the Wilmot Promiso (q.v.). It passed the Senate April 1864, 38 to 6, and the House 15 June 95 to 66, but the latter was not the needed two-thirds. In the next session the House passed it, and it was ratified by 31 States, and proclaimed in force 18 Dec. 1865.

The Fourteenth Amendment, in part a rephrasing of the Fifth, arose out of the first Civil Rights Bills (q.v.), which was pronounced nonenforceable as contrary to the decision of the Supreme Court in the Dred Scott Case (q.v.), that negroes were not citizens. As this decision was law until distinctly reversed, the Amendment was drawn, the first clause clearing away that decision. The other sections were: (1) A bribe to the South to give the negro the vote; (2) to give the negroes a clear field by debarring the Confederate leaders from it; (3) obvious. It passed both houses in June 1866, by overwhelming votes, but a long struggle ensued over ratification. The old Confederate States rejected it, to which Congress retorted by the Reconstruction Act of 2 March 1867, constituting provisional governments in those States till they had ratified the Amendment, and they did so. Maryland, Delaware and Kentucky also rejected it; and New Jersey and Ohio were captured by the Democrats and rescinded their ratifications, though it was doubtful whether this could be done. But finally 33 States ratified without them, and the Amendment was declared in force 28 July 1868.

The Fifteenth Amendment was practically a substitute for the second section of the Fourteenth, which was found valueless. In one respect it was weaker than the other, which prescribed a penalty for the offense, while this prescribed none; but its specification of the negroes as the class not to be excluded, and their race or color or former slavery as not legal grounds for disfranchisement, gave it apparently a clearer legal footing. In fact, however, it has been found as little worth as the other. It passed both Houses in February 1869, by immense majorities, was ratified by 30 out of 37 States, and declared in force 30 March 1870. New York fell into the hands of the Democrats and rescinded its vote; a notice was filed in the State Department, which reported that the State «claimed» to have rescinded its ratification, but paid no further attention to it. It is more than doubtful if such action of a State has the least validity.

The Sixteenth Amendment was passed by both Houses of Congress and on 31 July 1909 was deposited in the office of the Secretary of State. On 3 Feb. 1913 it received one more than the required three-fourths of the votes of the States when Delaware and Wyoming voted to ratify the amendment, and on 25 Feb. 1913 it was declared in force. The purpose of the amendment was to obviate the necessity of distributing direct taxes among the States in accordance with their respective populations. There was some objection to the words «from whatever source derived» since many believed that these words might be construed into the conferring of power on the national government to tax State and municipal bonds and other like properties, thus increasing the centralization of power and authority in the national government.

The Seventeenth Amendment, providing for the election of senators by the direct vote of the people, was introduced in Congress at the request of more than 30 State legislatures and in response to a popular demand that had resulted from 40 years of agitation. It was passed in the House 13 April 1912 and in the Senate 12 June, having already been ratified by the legislatures of three States — Massachusetts (22 May), Arizona (3 June) and Minnesota (10 June). On 9 May 1913 Wisconsin ratified the amendment, being the 36th State to take such action, and the amendment was declared in force 31 May 1913. See Conventions, Constitutional; Initiative; Referendum.

Ratification of the Amendments.— I to X inclusive were declared in force 15 Dec. 1791. XI was declared in force 8 Jan. 1798. XII, regulating elections, was ratified by all the States except Connecticut, Delaware, Massachusetts, and New Hampshire, which rejected it. It was declared in force 28 Sept. 1804. XIII, the emancipation amendment, was ratified by 31 of the 36 States; rejected by Delaware and Kentucky, not acted on by Texas; conditionally ratified by Alabama and Mississippi. Proclaimed 18 Dec. 1865. XIV, reconstruction amendment, was ratified by 23 Northern States; rejected by Delaware, Kentucky, Maryland and 10 Southern States, and not acted on by California. The 10 Southern States subsequently ratified under pressure. Proclaimed 28 July 1868. XV, negro citizenship amendment was not acted on by Tennessee, rejected by California, Delaware, Kentucky, Maryland, New Jersey and Oregon; ratified by the remaining 30 States. New York rescinded its ratification, 5 Jan. 1870. Proclaimed 30 March 1870. XVI, the income tax amendment, was ratified by all the States except Connecticut, Florida, Pennsylvania, Rhode Island, Utah and Virginia. It was declared in force 25 Feb. 1913. XVII, the amendment providing for the direct vote of United States Senators by the people, was ratified by all the States except Alabama, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Rhode Island, South Carolina, Utah and Virginia. It was declared in force 31 May 1913.

CONSTITUTIONAL CONVENTIONS. See Conventions, Constitutional; Constitution, Framing of the; United States — The Formation of State Constitutions; United States — The Federal Convention of 1787; United States — State Constitutions of the.

CONSTITUTIONAL LAW. See Law, Constitutional.

CONSTITUTIONAL MONARCHY. See Monarchy.

CONSTITUTIONAL UNION PARTY, in United States history, popularly known in its own time as the Bell-Everett party, from the names of its presidential candidates; the name assumed by the remnant of the Southern Whigs in 1860. The platform consisted of a preamble antagonizing all platforms in general as local, and a resolution recognizing as the only right and duty of every citizen the support of «no political principle other than the Constitution of the country, the Union of the States and the enforcement of the laws.» The leaders invited members of both parties to unite in forming a program ignoring the slavery issue altogether. In the election of 1860 it carried Kentucky, Tennessee and Virginia, and had a total popular vote of 589,581 and a total electoral vote of 39. After this campaign, the party was submerged in the Civil War and went out of existence.

CONSTITUTIONS, Fundamental. See Colonial Government, Proprietary.

CONSTITUTIONS, State. See United States — The Formation of State Constitutions; United States — State Constitutions of the; Conventions, Constitutional.

CONSTRUCTIVE CONTRACT. See Quasi-Contract.

CONSUBSTANTIAL, having the same substance or essence; coessential. When the Arian controversy ran high in the Church, and with the view of settling it, Constantine was induced to summon the general council of Nice in 325; the council pronounced in favor of the Athanasian view that the Second Person of the Trinity is *homoousios* with the Father. The difference between the persons of the Father and the Son, however, was maintained. To this the corresponding Latin term was *consubstantialis*. The Greek and Roman Catholic churches, as well as those of England and Scotland, with the leading Continental Protestant churches, still adopt this view; thus the second of the Thirty-nine Articles commences, «The Son, which is the Word of the Father, begotten from everlasting of the Father, the very and eternal God and *of one substance with the Father*.» Similarly the Westminster Confession of Faith — the standard of the proper Presbyterian churches — teaches that «In the unity of the Godhead there be three persons of one substance.» (Ch. ii, § 3).

CONSUBSTANTIATION, the doctrine that in the Holy Eucharist the real body and blood of Christ are present and are of the same substance with the bread and wine. The doctrine of Transubstantiation is that when the words of consecration are pronounced by the priest, the bread and wine are substantially changed into the body and blood of Christ, and consequently cease to exist as bread and wine. The doctrine of Consubstantiation, on the contrary, is that after consecration they continue to exist in their original form, but substantially conjoined with the body and blood of Christ.

This doctrine, generally ascribed to John of Paris, as its earliest advocate, has had few, if any, confessors. The term «Consubstantiation» is often incorrectly used to designate Luther's doctrine of the sacramental conjunction with the bread and wine, which is a very different thing from that of the substantial conjunction. Luther taught that the bread and wine are present in the natural, but the body and blood in a supernatural, manner. The presence is not «consubstantial»; for while the elements are masticated, swallowed, digested, etc., the body of Christ, according to Luther's teaching, is present only when the element is received by the communicant, as the words of distribution are repeated, and no longer. The presence of the elements is comprehensible, visible, tangible; that of the body and blood incomprehensible, invisible, mysterious and inexplicable. The belief that the body and blood of Christ can be received in the same way as the bread and wine, the Lutheran Church designates as «Capernaitic-error,» as the people of Capernaum, in John vi, 52, seemed to have had such an impression. Consubstantiation is sometimes called Impanation, which defines the relation between Christ and the elements in the Eucharist as a hypostatic union such as exists between the divine and human natures in Christ. Consult Hagenbach, 'History of Doctrines' (Vol. II), and for the Roman Catholic view consult Streber, 'Kirchenlexikon.'

CONSUELO, which appeared from the hand of George Sand in 1842–43, a fantastic tale with a number of genuinely historical characters, reflects the innumerable theories of social reform and the mystical, quasi-philosophical ideas then in the air. George Sand was at that time under the influence of the religious radical Lamennais, of the humanitarian revolutionary Pierre Leroux, of the Polish musician Chopin, of the Polish poet Mickiewicz and his Slavic mysticism. The action of 'Consuelo' is placed in the middle of the 18th century. The heroine, a wonderful Venetian singer, is a fanciful portrait of the author's friend, the singer Pauline Viardot. The character is made to embody the ideas of the Saint-Simonian socialists, of Liszt and of Lamennais, as to the sacerdotal rôle of great musical artists. She is the pupil of the noted composer and singing-master Porpora. Eluding a selfish and unworthy lover, she escapes and enters the castle of the noble family of Rudolstadt in Bohemia as music-teacher. The heir of the family, Count Albert, loves her. He is a strange being, living a mysterious life, who speaks and acts as though he reincarnated previous human existences. Here is again seen the influence on the author of Leroux and his theories of the immortality of man in humanity. Consuelo, not sure of her own love, escapes again and wanders through the world disguised as a boy with the young musician Haydn. At the court of Maria Theresa in Vienna she rises to fame in spite of the jealousy of her former lover's mistress, Corilla. But she is recalled to Rudolstadt by the illness of Count Albert whom she marries on his death bed, thus symbolizing the democracy of art and humanity and the union of classes. The later history of Consuelo is continued at equal length in the sequel, 'La Comtesse de Rudolstadt.' 'Consuelo' seems to-day old-fashioned and long-winded, but it embodied the genius of its author and the aspirations of an age of reformers whose ideas were yet nebulous and impractical. On the other hand it did not strain the patience of readers who had not outgrown the long stories of wandering adventure like 'Wilhelm Meister,' nor entirely forgotten the mysterious castles of Mrs. Radcliffe. 'Consuelo' remains, therefore, an important document for the understanding of past social theories as well as a once very popular work of fiction.

Charles H. C. Wright,
Professor of French Language and Literature, Harvard University.

CONSUL, the title given to the two chief magistrates of the ancient Roman Republic and to the three supreme magistrates of the first French Republic during the last five years of its existence. In present usage the term indicates an official who resides in a foreign seaport or other commercial centre as the representative of his home government and who is charged with the protection of his fellow-countrymen and the safeguarding of their interests.

The office of consul was created in Rome about 508 B.C., after the expulsion of the kings. The election to the consulship was annual, and only patricians were eligible until the Licinian laws opened the office to the plebeians.

In the history of France the title of consul appears after the fall of the Directory, when three consuls were appointed. The constitution of 13 Dec. 1799 gave to the first of these magistrates the real power, the others having only an advisory voice in the government. Napoleon Bonaparte became First Consul. In 1802 he was confirmed in the consulship for life, and in 1804 he abolished it by the establishment of the Empire. The office of consul in the present signification of the term had its origin in the extensive trade relations of the Italian cities of the 12th century.

In 1780 the first United States consul was commissioned. The consular system was established by acts of Congress in 1790 and 1792. The consular posts of the United States are arranged by statute in three classes: (1) Those in which the incumbents receive a fixed salary and are not allowed to transact business; (2) those to which a fixed salary is attached and business transactions permitted; (3) those in which the incumbents are compensated by fees collected in their offices and are allowed to transact business. There were in existence, 25 Oct. 1902, 315 consular posts. Among the responsibilities devolving upon United States consuls are the regulation of shipping, the issuing of passports and of certificates of births, deaths and marriages, the caring for disabled seamen and the ensuring of justice to native-born or naturalized American citizens. Consuls also send reports to the home government concerning foreign trade conditions. In countries where the government is unstable or despotic American consuls are vested with exceptional powers. They may exercise judicial functions over lawbreakers of their own nationality, such as fining, committing to prison, etc. Special powers and duties of consuls are determined by treaty. Before entering upon his duties a consul must receive an exequatur from the government to which he is accredited. No radical change has been made in the consular service of the United States since its establishment. President Cleveland by executive order in 1895 applied civil service principles to consular posts of a certain class. Of late there has been considerable agitation in favor of reorganizing the system.

Bibliography.— Schuyler, ‹American Diplomacy and the Furtherance of Commerce›; Straus, ‹Reform in the Consular Service›; Warden, ‹Origin, Nature, and Progress of Consular Establishments.›

CONSULAR SERVICE OF THE UNITED STATES. The first consul of the United States was appointed 9 Dec. 1780, although the commissioners of the United States in Europe had exercised consular functions in addition to their diplomatic duties prior to that time. Five years afterward Congress declared by a joint resolution that it was expedient that the United States should appoint consuls abroad, and expressly authorized American ministers in Europe to exercise the powers of consuls-general in the countries to which they were accredited. The Constitution, adopted in 1787, conferred upon the President the power to nominate, and by and with the advice and consent of the Senate, to appoint consuls. While President Washington in pursuance of the authority given him by the Constitution appointed a number of consuls and vice-consuls, no detailed law regarding consuls was passed until 14 April 1792. That law, which was to carry into effect our consular treaty with France, did not create or even regulate a consular system, but merely recognized its existence by imposing upon it certain specified duties. The act of 1 May 1810 appropriated salaries for the consuls at Algiers, Tangier, Tunis and Tripoli, which for nearly 30 years were the only consular salaries provided by law. For the most part, the United States, like most other nations, started by appointing unpaid consuls from among American merchants residing abroad, or, if they were sent from America, by permitting them to enter into business as a means of ensuring support. Consuls were also allowed to retain as compensation the fees collected for official services performed.

This so-called system was found to work badly for the interests of the government as well as the individual citizen, and as early as 1816 the Secretary of State, to whose discretion the administration of the service was left, proposed to Congress to pay fixed salaries to the consuls at more important places, at least. Efforts in this direction were continued from time to time with the object of so providing for the compensation of consuls that they could devote their time to their official duties, but nothing was accomplished until 1856, when Congress passed the law in pursuance of which the reorganization of the consular service upon substantially its present basis was effected. The aim of this act was to reduce the service to a regular system somewhat in line with the British consular service by providing for fixed salaries for the principal consuls, prohibiting those consuls from engaging in business and requiring them to remit to the Secretary of the Treasury all fees collected by them for performing official services. The appointment of consular officers is now in the hands of the President and by executive order of 1906 under the Lodge Act passed in that year, all consular officers except clerks, consular agents and vice-consuls, must pass a qualifying examination. The examining board consists normally of the Secretary of State, the Director of the Consular Service, the Chief of the Consular Bureau and the Chief Examiner of the Civil Service Commission.

Consular officers of the United States are divided into two classes, principal and subordinate. Principal officers are consuls-general and consuls. Subordinate officers are vice-consuls, consular agents, consular assistants, clerks, student interpreters and also interpreters. Consuls-general perform the same duties as consuls, and in addition have general supervision over consuls within the limits of their jurisdiction. There are five consuls-general at large, who inspect every consulate at least once in two years. Like consuls, consuls-general are appointed by the President and confirmed by the Senate. The senior vice-consular officers at a consulate fill the places and exercise the functions of consuls-general and consuls, when those officers are temporarily absent or relieved from duty. When the principal officers are present at their posts, they are subordinate to, and exercise their powers and perform their duties under, the direction of principal officers. They may be situated in a different city from their consulate. Consular agents are subordinate to principal consular officers, exercising their powers and performing their duties at ports or places different from those at which their principals are located. Their functions are not in all respects as extensive as those of principal officers, and they are not authorized to correspond with the Department of State. There are 40 consular assistants provided for by law. They are appointed by the President, after examination, and can only be removed for cause. They are assigned from time to time to consulates with such duties as the Secretary of State may direct. Besides these there are clerks at a salary from $300 to $1,500 a year and a corps of student interpreters, 10 in China, 6 in Japan and 10 in Turkey. The salary of a student interpreter is $1,000, plus allowances for studying. When qualified, they may be appointed interpreters at varying salaries. Consular officers qualify by taking a prescribed oath, and all except consular agents and consular clerks are required to file a bond to the United States for the faithful performance of their duties. The salaries of consuls-general and consuls range from $2,000 to $6,000 a year. Vice-consular officers receive no fixed salaries, but when in charge of a post they receive half as much as the principal officer normally holding it. Consular agents receive as compensation one-half of the official fees collected by them up to $1,000. Consular assistants receive salaries of $1,000 for the first three years' service, after which their salaries are gradually increased to $1,800 a year. All fees for unofficial and notarial work are retained as personal compensation by the officers collecting them.

The duties of consuls of the United States are varied, and include the shipment, discharge and relief of seamen of American vessels; adjustment of differences between masters and crews; reclamation of deserters; protection of citizens of the United States; settlement of estates of citizens who may die intestate in foreign countries; issuance of bills of health certifying to the sanitary condition of the cargo, passengers and crew of vessels clearing from foreign ports for ports in the United States; issuing and viséing of passports; superintending the disinfection of merchandise exported to the United States from a district in which infectious diseases exist; execution of landing certificates; and certification of invoices of merchandise valued at more than $100 exported to the United States. The latter duty is highly important for the protection of the customs revenue, and makes it necessary for consular officers to examine carefully each invoice before certifying that the prices stated therein are correct. In case the merchandise is found to be undervalued, notice of the fact is sent to the collector of customs at the port in the United States to which the merchandise is destined.

	Salaried	Compensated by fees	No. compensation	Total
Consuls-general	50	......	......	50
Consuls	247	......	......	247
Vice-consuls	......	......	338	338
Consular agents	......	128	......	128
Consular assistants	38	......	......	38
Student interpreters	20	......	......	20
Interpreters	10	......	......	10
Total	365	128	338	831

Consular officers are not permitted to solemnize marriages, but they may, when requested, be official witnesses of the ceremony of marriage where one of the parties is a citizen of the United States. In such cases they give each of the parties a certificate of the marriage, and forward a certificate thereof to the Department of State. Under section 4082 of the Revised Statutes marriages in the presence of a consular officer of the United States in a foreign country, between persons who would be authorized to marry if residing in the District of Columbia, are declared to be valid and to have the same effect as if solemnized in the United States, but the operation of this statute outside of the District of Columbia and the Territories is doubtful.

The exemptions and privileges of consular officers depend largely upon the treaties existing between the United States and the countries to which they are accredited. In the absence of treaties, consuls after receiving their exequaturs are regarded both as officers of the state which appoints and the state which receives them under the special protection of international law. They may claim inviolability of the official property and archives; exemption from military service and service on juries, and the right to place the arms of their government over their doors.

By virtue of treaties and Title XLVII of the Revised Statutes, consular officers in China, Siam, Turkey, Morocco, Maskat, Persia, Zanzibar and Tripoli are invested with judicial powers. In China, Turkey and Siam, consuls are empowered to arraign and try all citizens of the United States charged with offenses against law, committed in that country, and to sentence offenders. They also have jurisdiction in civil cases between American citizens. In the trial of cases between citizens of the United States and subjects of China or Siam, the consuls of the United States act in conjunction with the Chinese or Siamese officials. In case of disputes between Turkish subjects and citizens of the United States in Turkey, provision is made for the presence of the dragoman of an American consulate at the hearing. The treaties with Persia, Maskat, Morocco, Zanzibar and Tripoli give consular officers jurisdiction over cases the parties to which are American citizens, and provide for the assistance of consuls in the trial by the foreign tribunal of cases in which one party is a citizen of the United States and the other a subject of the foreign power.

The duties of consular officers with respect to the development of our foreign trade are of comparatively recent origin, but, owing to increased competition among commercial nations, have become of special importance within the past few years. Every consular officer is now expected to have accurate knowledge of the conditions of trade and commerce of the place where he is located, and he is required to keep the Department of State fully informed regarding all matters of interest touching the industries, trade, commerce and navigation of the country of his official residence. He must be alert and report promptly new markets for American products or manufactures, the construction of public works, changes in transportation rates and facilities, the opening up of new trade routes, changes in economic conditions within his district, improvements of old and development of new industries, including inventions or discoveries, development or decline of commercial and manufacturing centres, projects for great manufacturing or other industrial enterprises, river and harbor improvements, hygienic and quarantine measures, fluctuations in rates of wages, changes in tariff legislation, the enactment of patent, trade mark and copyright laws, and legislation preventing the adulteration of food, and all other information of value to the commercial and industrial interests of the United States. The information reported that may be of current interest is printed in a publication known as *Daily Consular Reports*, which has been issued daily since 1 Jan. 1898. Till 1903 they were known as *Advance Sheets of Consular Reports*. The reports are collected at the end of every month and printed in a periodical monthly, *Monthly Consular Reports*, established in 1880. More comprehensive reports are prepared annually under special instructions of the Department of State with the object of presenting a statement of the trade, not only of the United States with the rest of the world, but of the various countries with each other, and these reports are published under the title of 'Commercial Relations.' From time to time, at the suggestion of individuals or firms seeking information as to conditions in foreign countries, special reports are obtained from consuls and are printed in separate form.

The volume known as 'Consular Regulations,' the latest edition of which was published in 1896, contains all the laws, treaties and regulations which govern consular officers in the performance of their duties. This is supplemented by the 'Digest of Circular Instructions to Consular Officers,' the latest edition of which appeared in 1908. Consult also *Senate Report*, No. 1202 (56th Congress, 1st Session).

CONSULATE (Fr. *consulat*). The form of government in France from the overthrow of the Directory, 9 Nov. 1799 (18th Brumaire) to 18 May 1804, when the First Consul (Napoleon Bonaparte) was made emperor. After the fall of the Directory the Council of Ancients and the Five Hundred appointed three consuls — Bonaparte, Roger Ducos and Sieyès. Sieyès and Ducos soon retired on pensions and were replaced by Cambacérès and Lebrun. On 24 Dec. 1799 Bonaparte became First Consul. The consuls were elected by the Senate for 10 years. The Senate itself was composed of 60 members appointed for life, and there were also a Tribunate of 100 members and a Legislative Assembly of 300 members. The powers of these chambers were greatly restricted while those of the First Consul were almost absolute, all ministers, councillors of state, military and naval officers and nearly all judges being appointed by him. In May 1802 Bonaparte, who had already held a magnificent court at the Tuileries, was re-elected First Consul for 10 years, and in the following August he became First Consul for life. On 18 May 1804 Bonaparte was made emperor, having long enjoyed the prerogatives of the office in fact if not in name. (See FRANCE; NAPOLEON I). Consult Thiers, 'Histoire du consulat et de l'empire' (Paris 1845-62), and the numerous lives of Napoleon.

CONSULTA, the committee of three members of the Council of State of the Netherlands from 1559 to 1567, during the regency of Margaret of Parma. The three were Barlaymont, Viglius and the Bishop of Arras.

CONSUMERS' LEAGUE, an organization intended «to promote better conditions among the workers» by encouraging the purchase of goods made and sold under proper conditions. The work of the organization is based upon the principle that the purchase of an article tends to create a demand for that article, and that in the stress of modern competition manufacturers and merchants are unable to improve the condition of their employees while there is a constant demand for cheap goods, «regardless of how cheapness is brought about.» The movement had its origin in England in 1890 and the first consumers' league in the United States was organized in New York in 1891; its object was to investigate retail stores and to encourage the patronizing of those conforming to their standard of conditions. Similar leagues now exist in nearly all the larger cities and towns of the United States and in many in Canada. The standard for a «fair house» demands: (1) Equal wages for women and men for equal work, wages to be paid by the week; (2) reasonable hours of employment according to local conditions, overtime to be paid for and a half-holiday in the summer; (3) retiring and lunch rooms to be separated and regulated according to the sanitary laws; (4) recognition of fidelity and length of service and general considerate treatment.

The National Consumers' League was organized in 1898 for the purpose of regulating conditions of manufacture rather than sale. The national organization is a federation of State leagues; the governing body is a council consisting of representatives from the State leagues. The council annually elects a president, two vice-presidents, two secretaries and a treasurer; and these, with two representatives from each State league, constitute the executive committee of the council. Any person living where there is no local or State league may join the national society by paying a yearly fee. The main lines of its work are enlisting the aid and interest of authorities in the enforcing of labor laws and furthering of necessary legislation; investigating conditions of labor and awarding the use of the league's label to manufacturers conforming to their standard; educating public opinion by lectures, correspondence and literature. The standard for establishments entitled to the label demands: (1) That all State factory laws be complied with; (2) that the label be used only on goods made on the premises; (3) that no children under 16 be employed; (4) that no person work over 60 hours a week; (5) the league shall have the right of inspection. The national organization embraces leagues in all the States.

Bibliography.— Brooks, 'The Consumers' League'; Brooks, 'Label of the Consumers' League' (in the American Economic Association's Publications, 3d series, Vol. I, 250-258); Kelley, 'Aims of the Consumers' League' (in the *American Journal of Sociology*, Vol. V, 289); Lowell, 'Consumers' League'; McVey, 'Work and Problems of the Consumers' League' (in the *American Journal of Sociology*, Vol. VI, 764); and the reports of the National Consumers' League.

CONSUMPTION. There have been two meanings given by economists to the term consumption of wealth. By one group it has been made to include any utilization of wealth in which the wealth is used up or destroyed in the process. By another group it means only such utilization as gives direct satisfaction to a consumer. Under the first definition, coal is consumed when it is burned to make steam for the running of machinery as well as when it is burned to supply warmth for the comfort of the human body. Under the second definition only the latter use of coal would be called consumption. They who hold to the first definition are compelled to divide consumption into two kinds, namely, productive consumption and unproductive consumption. It is always explained, however, that the term unproductive consumption does not mean useless or unnecessary consumption. It means merely that wealth thus consumed, in contradistinction to that which is productively consumed, is not used up in the process of producing other wealth. It is used, rather, for the final purpose for which all wealth is produced, namely, the direct satisfaction of human desires or needs.

The tendency among recent writers is to use the term consumption in the narrower sense. By the consumption of wealth under this definition is meant the culmination of the whole economic process, namely, the satisfaction of human desires. Wealth which is used up or worn out in the process of production is not itself yielding consumers' satisfactions directly. It is helping to produce other things which will directly satisfy consumers and may therefore be said to be indirectly satisfying desires. By the consumption of wealth, under this narrower definition, is meant its utilization in the direct satisfaction of human desires. The physician's automobile which is used in his profession is being worn out, but it is not being consumed in the technical economic sense. But when it is used for his own enjoyment or that of his family it is being consumed. Again, a thing may be in the process of consumption even though it is being used up very slowly. A diamond which is used as an article of pleasure or adornment is in the process of consumption even though it may never be really worn out. A substantial piece of furniture, when used for direct satisfaction, is being consumed. While it is in a furniture store, the immediate purpose of the owner is to gain a profit from it rather than to enjoy it. Therefore it is not yet in the process of consumption. In short, the consumer of an article is the one whose desires it satisfies directly. The article begins being consumed whenever it begins satisfying a consumer's desires directly, that is, when it has passed through all the channels of business and trade, where it was used for the purpose of getting an income, and passes into the possession of someone for whose satisfaction it was designed.

Most textbook writers on economics have regarded the consumption of wealth as a department of the subject, co-ordinate with such departments as production, exchange and distribution. None of them, however, has given as much space to it as to these other departments. The reason apparently has been the general opinion that consumption is essentially an individual matter with which the public has had little or no concern. Laws relating to consumption have been called sumptuary laws, and have generally been condemned, or only half-heartedly approved. There is a growing opinion, however, that consumption is quite as important, from its effects on national prosperity, power and greatness, as any department of economics. Even the regulation of consumption, as in the case of laws regulating or prohibiting the use of alcoholic beverages, is becoming popular. Probably no movement of the present day in America is quite so popular or so democratic as the prohibition movement.

The importance of the consumption of wealth is further emphasized by the consideration that as many and as dire calamities have overtaken nations and peoples because of their irrational habits of consumption as because of inefficient systems of production, exchange or distribution. In fact, there is a very profound reaction of consumption upon all the other departments, particularly upon distribution. The standard of living of the laboring classes, which is a part of consumption, has much the same influence upon the price of their labor as that exercised by the cost of production upon the price of a material commodity. Again, the rate of the accumulation of capital, upon which so many things depend, is largely determined by the habits of consumption. The effect of luxury upon industry and general national strength is one of the largest of all questions. These illustrations are enough to show that the subject of consumption deserves the most careful study and the most serious treatment which economists can give it. Systematic work on the principles of consumption has been done by Cuhel, 'Zur Lehre von den Bedürfnissen' (Innsbruck 1907), and Brentano, 'Versuch einer Theorie der Bedürfnisse' (Munich 1908). Examples of the application of the principles of consumption to the problems of progress are found in Patten, 'Theory of Prosperity' (New York 1902), and Sombart, 'Der moderne Kapitalismus' (Leipzig 1902). See DISTRIBUTION; INCOME; WEALTH.

THOMAS N. CARVER,
Professor of Political Economy, Harvard University.

CONSUMPTION. See TUBERCULOSIS.

CONTACT, in astronomy, a word used in describing eclipses of the sun and moon, and also the transits of the inferior planets. In a solar eclipse contact takes place at the instant when the limbs of the sun and moon just touch each other either exteriorly or interiorly; in a lunar eclipse, when the shadow of the earth just touches the limb of the moon; and in the case of a transit of Venus or Mercury, when the limb of the planet just touches the sun's limb either exteriorly or interiorly. The instant of interior contact and of exterior contact are distinguished by these names.

CONTACT ACTION. See CATALYSIS.

CONTACT METAMORPHISM. See METAMORPHISM.

CONTAGION. Before the time when the microscope and other laboratory aids showed the actual causes of many disease processes in the human — and other animals — body, the word contagion was surrounded by much mystery. At the present time the term «communicable» is preferable. Thus communicable diseases are those which result from actual or remote contact with the host. There are a great many such communicable diseases. The actual contagium or causative factor is known for many, while for others it has yet to be definitely determined. In many instances where the actual contagium is known, the method of the transmission is still in doubt. Thus in the group of exanthematous diseases such as measles, scarlet fever, smallpox, chickenpox, the actual contagion has not been demonstrated. For diphtheria, whooping cough, boils, carbuncles, tuberculosis, typhoid fever, cerebrospinal meningitis, gonorrhea, plague, cholera, pneumonia, erysipelas and influenza the actual causative agents are minute plants belonging to the group of bacteria. The contagium of syphilis, sleeping sickness, yaws, Aleppo boil and a group of related diseases are minute animalculæ of the protozoa group. The contacts here are direct; while malaria, which is also a communicable disease, is caused by a minute animal form of the protozoa group, which is usually transmitted by an intermediary host, such as the mosquito. Thus in malaria the process is as follows: The minute animal form causing it is found in the blood and other tissues of the sick individual. This is taken into the body of a biting mosquito, usually of a special type, Anopheles; for the common chills and fever of the United States, the malarial parasite undergoes a series of changes in its mosquito host and then is carried to a well individual through the bite of an infected mosquito. In former years much nonsense was talked and taught by physicians about miasmas, and dangerous night air, and the harmfulness of dampness, etc. The dangers existed, not in a hypothetical miasm, but in real mosquitoes that usually flew and fed about dusk and which lived in wet, springy localities. If there were no patients with the parasite, there would be no malarial plasmodia to be communicated. Hence malaria is stamped out either by getting rid of mosquitoes or isolating patients and preventing the mosquitoes from carrying away blood with the real cause.

Many communicable diseases are borne by the air and involve the respiratory tract. Influenza and pneumonia are among these. In epidemics breathing masks worn by the sick may prevent spread of contagions. Typhoid fever and cholera are usually communicated by means of the digestive canal. They are best eradicated by proper sanitation. They are preventable. A community which has much typhoid fever is deficient in social intelligence. Such a community prefers corrupt politics to clean water supplies and deserves what it gets, the death of its young people. High percentages of typhoid in communities is in direct proportion to the social enlightenment of the same communities.

In general it may be said that so-called disinfectants, etc., which are used to prevent communicable diseases are a relic of the dark ages. «Cleanliness is next to godliness» is a good maxim, but should apply to spiritual cleanliness as well. The fight against gonorrhea and syphilis is a losing one. The moral tone of the race is still too infantile to stamp these scourges out in the community as yet. Certain restrictive measures are of some service, but a higher degree of sexual intelligence is needed to combat these two prevalent communicable diseases. So long as knowledge of the most important function of the human race is considered improper, so long will gonorrhea and syphilis be widespread. When the community realizes that sex knowledge is the most important kind of knowledge to have, then that community will gain the ascendancy over the so-called venereal diseases, and those individuals who have grown away from their infantile sexuality will live.

There is a whole group of communicable diseases due to contagions from animals. Such are tape worm, hook worm, round worms, etc. Here the ova, or eggs, pass from the animal direct, through handling dirty animals, dogs particularly, or the fecal matter containing the ova is conveyed through water supplies, or through food contaminated by infected water. The old distinctions between contagion and infection are no longer tenable, hence the terms are used interchangeably, or better, supplanted by the term communicable.

Smith Ely Jelliffe.

CONTARINI, kŏn-tä-rē′nē, the name of a noble family of Venice, one of the 12 that elected the first doge. The most important members were Domenico, doge of Venice from 1043 to 1071 or 1073. He rebuilt Grado, and reduced the city of Zara, which had revolted. During his reign the rebuilding of Saint Mark's Church was undertaken. Jacopo, doge from 1075 to 1080. Under his reign the Venetians forced the city of Ancona to acknowledge their sovereignty over the Adriatic Sea. Andrea, doge from 1367 to 1382. The Genoese, under Pietro Doria, had conquered Chiozza in 1379, and threatened even Venice. Andrea Contarini reconquered Chiozza, captured the Genoese fleet and delivered the republic from its enemies (1380). Francesco, frän-chĕs′kō, doge from 1623 to 1625. Under him Venice, in alliance with Louis XIII of France, the Duke of Savoy and the Protestant cantons of Switzerland, reconquered the Pays de Vaud in 1624, of which the Austrians had taken possession. Carlo, doge from 1655 to 1656. Under his reign Lazaro Mocenigo, admiral of the republic, in June 1655 gained a brilliant victory over the Turks in the Dardanelles. Domenico, doge from 1659 to 1674. During his government Venice resisted for five years the attacks of the Turks on the island of Candia; but on 26 Sept. 1667, after a siege and defense of unexampled obstinacy, Francesco Morosini surrendered the island. Ambrogio, ăm-brō′jō, from 1473 to 1477, was ambassador of the Republic at the court of the King of Persia, Usun Kassan. The interesting description of his residence at this court first appeared at Venice in 1487, in Italian. Gasparo, diplomatist, who served as Venetian Ambassador to the Diet of Worms in 1521. From there he accompanied Charles V to the Netherlands, England and Spain and negotiated a permanent peace between the Republic and Charles V in 1529. Pope Paul III conferred on him the cardinal's hat in 1535. In 1541 he was papal legate at the Diet of Ratisbon, where he distinguished himself by his moderation. After his return he was sent as legate to Bologna, where he died in 1542. Giovanni: b. Venice 1549; d. 1605; was one of the most distinguished painters of his age. He worked in the style of Titian, and was particularly skilful in painting ceilings; for example, his 'Resurrection' in the church of San Francesco di Paolo, in Venice. Vincenzo, vēn-chĕn′zō: b. Venice 1577; d. 1617; a scholar whose reputation was in early life so great that the magistrates of Padua established a new chair of Latin and Greek eloquence only to retain the learned youth of 26 years of age in their city. He lectured there until 1614. At one time there were no less than 18 branches of the family; one of the most important was that of Contarini dallo Zaffo or di Giaffa who had been invested with the countship of Jaffa in Syria for their services to Caterina Cornaro, queen of Cyprus; another was that of Contarini degli Scrigni, so called on account of their great wealth.

CONTÉ, kôn-tā′, **Nicolas Jacques,** French inventor: d. Annon-sur-Orne, near Sées, 4 Aug. 1755; d. Paris, 6 Dec. 1805. He was at first a painter but afterward turned to the mechanical arts and when France was deprived through its war with England of its plumbago supply, he invented a substitute in the shape of a mixture of graphite and clay which was subsequently used for the manufacture of black lead pencils, known as «crayons Conté.» This process was the foundation of all subsequent manufactures of pencils. After several successful experiments in the use of the balloon for military purposes he was made director of the French Aërostatic Institute and chief of the aërostatic corps of the army. He accompanied the French army at the time of Napoleon's expedition to Egypt and erected works in Cairo for the manufacture of arms, ammunition, surgical instruments, bread and other necessaries. He also invented a barometer (1798) similar to Vidi's. In 1802 he instigated the foundation of the Society for the Encouragement of National Industry. When the results of the Egyptian expedition were ready to be published, Conté was commissioned to take complete charge of its production. He endeavored to construct an engraving machine for this purpose, but died before the work was well under way. Consult Jomard, 'Conté, sa vie et ses travaux' (Paris 1852).

CONTEMPORANEITY OF GEOLOGICAL STRATA. Formerly strata found partly with identical, partly with allied fossils, were held to be exactly contemporary, though widely separated on the earth's surface; now the same facts are used to establish the contrary conclusion. If each species came into existence at a certain spot on the earth's surface, from which it gradually spread in various directions, it cannot have reached a remote region till some considerable time after its birth. Two strata, then, widely separated in the world, containing some species common to both, are contemporaneous in this sense, that they were formed while that species lived; but the stratum near its birthplace is likely to be older than the one to which it spread after it had already multiplied greatly and rooted itself successively in all of the intervening regions, wherever a place appropriate for its habitation could be found.

CONTEMPT, a wilful disregard or disobedience of a public authority. The Constitution of the United States provides that each House of Congress may determine the rules of its proceedings, punish its members for disorderly behavior, and, with the concurrence of two-thirds, expel a member. The same provision is substantially contained in the constitutions of the several States. The power of making rules carries with it that of enforcing them, and the power to attach persons who violate them, and to punish them for contempt. Courts of justice have an inherent power to punish all persons for contempt of their rules and orders, for disobedience of their process and for disturbing them in their proceedings. The penalty is fine or imprisonment or both. The guilty person may have these penalties remitted by "purging" the contempt, i.e., by making pecuniary reparation for any damage resultant of his action, and by apologizing for his fault. The breach of the rules of conduct set down by the judiciary for certain persons, though committed out of court, is a contempt, also. The use of this jurisdiction of punishment for contempt in labor disputes has been given the name of "government by injunction" as an arbitrary method of dealing with offenses without trial by jury and the other safeguards of criminal law. Consult Rapajje, 'Treatise on Contempt' (New York 1884); and Oswald, 'Contempt of Court, Committal and Attachment and Arrest on Civil Process' (London 1895).

CONTES BLEUS, kônt' blē' (Blue Tales). The 'Contes bleus' of Edouard Laboulaye are stories, mainly fairy tales, from various sources, including the invention of the author, which owe their charm not merely to the material of folk-lore that they contain and to the stamp of the popular imagination that it bears, but also and in larger measure to the alert, graceful and good-humored style in which they are told. For Laboulaye was really very far from the naïve popular imagination in which fairy tales were born, and even in retelling authentic ones he slips in many a mischievous thrust at the weaknesses of poor human nature, many a satirical reflection on social and political institutions, and often comes dangerously near pointing a moral. Indeed he distinctly recommends the reading of fairy tales for children for their moral value. "There is often more moral stuff in a fairy tale," he says, "than in all the history of Rome. They were born of the wisdom of the race." In proportion as he draws more on his own invention, the marvelous becomes the transparent mask of whimsical satire directed against the vices and foibles of men and informed by the love of free and liberal institutions of which Laboulaye was an ardent defender. By the nimbleness of the mind that plays about the most various themes and touches grave questions with a laugh, by the sparkling wit and the mordant irony, some of these tales might almost be taken for "contes philosophiques" of Voltaire — of a lesser, good-humored Voltaire, without the sneer.

The 'Contes bleus' appeared in three volumes: 'Contes bleus' (1863); 'Nouveaux contes bleus' (1867); 'Derniers contes bleus' (1883). They have been in part translated by Mary L. Booth under the title Laboulaye's 'Fairy Book' (New York 1866).

Arthur G. Canfield,
Professor of Roman Languages, University of Michigan.

CONTES D'HOFFMANN, Les, opera by Offenbach (q.v.), first produced in Paris, 10 Feb. 1881; in New York, 14 Nov. 1907.

CONTES DE FÉES, kônt' dė fā' (Fairy Tales). The 'Contes de Fées,' or Fairy Tales, published in 1697 under the name of "Perrault Fils," who was then only 10 years old, were written by his father, the Academician Charles Perrault, better known through his controversy with Boileau about the relative merits of the Ancients and Moderns. The stories were not original, but belonged to the universal folklore, as old as humanity itself; to Perrault belongs the credit of having given to them a definite literary form, not entirely free from certain mannerisms of the time, yet simple, natural and well adapted to the subject and to the minds of children. Such stories as 'Blue Beard,' 'Puss in Boots,' and 'The Sleeping Beauty' have become a part of the world literature of childhood, and have been widely imitated everywhere.

Published under the title 'Contes de ma mère l'Oye,' or Stories from Mother Goose, both stories and title have caused many speculations as to their origin. The most plausible theory about the origin of such stories is that the human mind in its infancy received the same impressions from the various phenomena of nature, and from its own feelings of hunger, fear, love, etc. The stories telling of such emotions were further modified by migrations to different countries and climes. 'Mother Goose' has been said to represent many noted personalities, from the wife of Charlemagne to the Queen of Sheba, and even the Virgin Mary! She is more likely the personification of the "Grandmother" or the "Old Nurse" giving free rein to her imagination for the entertainment of young children. The "Fairies" who do such wonderful things in these stories are, as their name indicates (French: *fée;* Latin: *fatum, fata,* fate, destiny), the living representation of the many influences which affect our lives, favorably or otherwise. They are creations of the mind instinctively attracted and affected by the unusual, the mysterious and the unknown.

Perrault's 'Fairy Tales' have been translated into all languages; they have brought about the collection of many stories of folk-lore in all countries, and have been widely imitated, particularly by the Brothers Grimm, Hans Andersen, etc., and in France by George Sand, 'Stories of a Grand Mother'; Ch. Nodier, 'Evening Stories'; and Daudet, etc.

LOUIS A. LOISEAUX.

CONTESTED ELECTIONS. See ELECTIONS.

CONTI, kôṅ'tē', the name of a distinguished French family, a younger branch of the Bourbon house of Condé, deriving its title from the small town of Conti near Amiens. It sprang from Armand de Bourbon, Prince of Conti, brother of the great Condé (b. 1629; d. 1666). He took an active part in the troubles of the Fronde both for and against the court, and married the niece of Mazarin. His son, François Louis (b. 1664; d. 1709) was brought up under the eyes of the great Condé, served with distinction under the Duke of Luxembourg, and was elected king of Poland by a number of the magnates, but declined the honor. The last of the house of Conti was Louis François Joseph, b. 1734; d. 1814.

CONTI, Augusto, Italian philosophical writer: b. San Miniato, Tuscany, 1822; d. 1905. He studied law at several Italian universities and practised in Florence until 1848, when he enlisted as a volunteer for service against Austria. Subsequently he practised law and taught philosophy at San Miniato, in 1855 was made professor of philosophy in Lucca, in 1863 professor of the history of philosophy in Pisa, and in 1864 professor of mental and moral philosophy in Florence. His published works include 'Evidenza, amore e fede, o i criteri della filosofia' (1862, and subsequent editions); 'Storia della filosofia' (1864); 'L'Armonia delle cose' (2 vols., 1878); 'Filosofia elementare' (1869; 9th ed., 1879); 'Dio come ordinatore del mondo' (1871); 'Il vero nell' ordine' (1876, 1891). In these works Conti makes an earnest attempt to bring into agreement the teachings of different philosophical schools.

CONTINENT. A definition of continent based on the origin and development of land masses is not possible in the present state of our knowledge, and about all that can be done is to define a continent as a very large body of land. Africa, North America, South America, Europe, Asia and Australia are such land areas, but since Europe and Asia form a single land mass, many physical geographers speak of the two as one continent — Eurasia. There is also probably a land area of continental size in the Antarctic regions.

Origin of Continents.— The solid earth, the lithosphere, is largely covered by water, the hydrosphere; the proportion of land to water on the surface of the globe being about 1 to 2.63, making the land surface about 27.5 per cent of the total. The extreme height of the land above sea-level is about five miles (Mount Everest 29,000 feet), and the extreme depth of the ocean somewhat more; the extreme relief of the lithosphere is therefore over 10 miles. According to Lapparent the mean elevation of the continents is as follows: Europe 958 feet; Australia 1,118 feet; South America 1,702 feet; North America, 1,953 feet; Africa 2,007 feet; Asia 2,883 feet. The mean height of all land is estimated at a little over 2,000 feet, and the mean depth of the ocean at 12,000 to 15,000 feet. Therefore if the solid earth, the lithosphere, were free from inequalities, the hydrosphere would cover it, perhaps to a depth of over two miles. Inequalities of surface have, however, existed since the earliest geological time of which we have knowledge. The oldest rock formations show traces of sedimentary origin, and therefore represent in part the waste of land areas from the action of streams and the waves of the ocean. So far as North America is concerned the position of the continent had been determined in Archæan time. What determined the position of this and other continents is, however, still an unsolved problem, though there are several theories, each with some show of reasonableness.

The generally accepted theory is that when the crust of the molten earth had solidified and cooled enough to allow the condensation of aqueous vapor, it cooled and contracted unequally, some parts cooling and contracting toward the centre more rapidly than others. Thus were formed areas of depression and elevation, the seas filling the former, and the higher parts of the latter projecting above the water as land. The water would hasten cooling under the depressions, and thus the general tendency would be to increase the area and elevation of the land and increase the depth, but decrease the area of the sea. Those who hold that the earth was never molten believe that the oceanic segments are heavier than the continental (a fact substantiated by actual investigation), and that as a result, the continental blocks are forced aside and up by the settling of the heavier oceanic blocks.

Distribution and Form of Continents.— The distribution and form of continents show some curious features, and on these features theories of the origin of continents have been based. North and South America, for instance, are roughly triangular in shape, with the apex of the triangle at the south. Eurasia and Africa together form another roughly triangular land area tapering to the south, the Cape of Good Hope being the apex of the triangle. Owing to the lands tapering to the south, the northern hemisphere contains more land than the southern, and it is possible to divide the globe, by taking a north pole in the English channel, into two hemispheres, one nearly all land, and the other nearly all water.

Continents consist typically of a great interior basin bordered by mountain ranges, this form being shown by the continents of somewhat regular outline, the irregular Eurasian continent being an exception. In each continent the greatest mountain system faces the greatest ocean. In North and South America these mountains are on the west, facing the Pacific, with the smaller Appalachian Mountains, the Venezuelan Mountains and Brazilian highlands facing the Atlantic. In Africa the greatest range is on the east, facing the Indian Ocean, in Australia the greatest range faces the Pacific, and in Asia the Himalayas face the Indian Ocean. Omitting the mountains of Eurasia, the mountain chains of the world have a northwest-southeast or northeast-southwest direction, and on this account the continents taper toward the south.

From the base of the mountains to the sea is a gentle slope or plain, and this plain extends frequently some distance beyond the shore, forming a continental platform or shelf. The outer edge of this platform is usually at a depth of about 100 fathoms (600 feet) when the bottom slopes rather sharply — forming the continental slope — to the depths of the ocean. Off the coast of New Jersey the 100-fathom line is 110 miles from shore, while on the coast of California it is only about 10 miles from shore. Great Britain stands on such a shelf and is really part of the continent of Europe. In the same way the East India islands to Celebes are part of Asia. New Zealand may be considered part of Australia.

Permanency of Continents.— It is one of the commonplaces of geology that the lands are continually changing; by weathering, by rivers and by the waves of the ocean the rocks are worn away and spread out as sediments on the sea floor. In some parts of the world the land is apparently rising, in others sinking. The northern coast of Norway is rising five feet in 100 years, the coast of New Jersey and parts of the New England coast are sinking. At Boston the rate is about one foot in 100 years, and on the New Jersey coast two feet. Yet geologists, while admitting the instability of the lands, differ as to the permanency of continents. Lyell believed that neither continents nor oceans — so far as any particular part of the earth is concerned — are permanent. His views have been opposed by later geologists, who have thought that while continents may change form, certain parts of the earth have always been covered by oceans, while others have not; the Atlantic and Pacific, for instance, were always oceans, while the continents, even if at times partly covered with water, have always been uplifts in the sea floor, or if not always, at least since Archæan times.

It is recognized, of course, that these uplifts have been under shallow, or epicontinental, seas many times. This is shown by the following facts. In the first place, chalk beds corresponding to the globigerine ooze that covers much of the ocean floor are found in the interior of continents; in the second place, the study of fossils has shown that at times in past ages continents now separated by oceans had essentially the same fauna and flora. The evidence of deep-sea deposits shows that in Cretaceous time a fairly deep sea covered much of Mexico and parts of Texas, New Mexico, Arkansas and Kansas, while another, or perhaps the same wide, deep sea covered southern Europe and northern Africa and extended across Asia to the Pacific. In Cretaceous time, therefore, the continental land masses did not have their present form and arrangement, and theories as to the origin of continents based upon present land forms are at best of doubtful value. The evidence of fossils indicates that in Permian time the Antarctic land mass was of far greater extent than now, and joined South Africa, Patagonia and Australia. Again in Cretaceous time the evidence indicates that Brazil, south central Africa, Madagascar and India were connected by land masses, so that the Atlantic and Indian oceans had not at all their present shape. There is some reason for believing that no longer ago than the beginning of the Glacial Period the Arctic lands were of far greater extent than now, Asia, North America and Europe being connected. Thus, while it is fair to assume that the position of the continents was determined ages ago, there is nothing permanent about their forms or the present distribution of land and water on the earth. See GEOGRAPHY; GEOLOGY.

Bibliography.— Mill, ‘International Geography’ (New York 1900); Suess, ‘Das Antlitz der Erde’ (Leipzig 1885); English trans., ‘The Face of the Earth’ (Oxford 1904–09); Dana, ‘Manual of Geology’ (New York 1895); Neumayr, ‘Erdgeschichte’ (Leipzig 1895); Penck, ‘Morphologie der Erdoberfläche’ (Leipzig 1894).

CONTINENTAL CONGRESS. See CONGRESS, CONTINENTAL.

CONTINENTAL DEPOSITS. See TERRESTRIAL DEPOSITS.

CONTINENTAL MONEY. See MONEY, PAPER, *Continental Money.*

CONTINENTAL NAVY. During the summer and fall of 1775, the British attempts to subdue resistance in the colonies on land was supplemented by harrying their shipping and coasts by sea. Several merchant vessels were made prizes in violation of law. Gloucester was fired on, and Bristol bombarded to obtain provisions. Most of the colonies equipped armed vessels for themselves and commissioned privateers. On 5 October news came that two British transports were on the way to Quebec with military stores; and as our armies needed these worse than the British, Congress on the 13th appointed a board of three (Silas Deane, John Adams — afterward replaced by Christopher Gadsden — and John Langdon) to fit out two swift armed vessels and intercept these or any other store-ships. This board was the Navy Department of the Revolution for a time; it was turned into a marine committee, marine board, etc., with under boards called the Continental Naval Board, Board of Admiralty, etc. On 18 October Falmouth (now Portland) was bombarded and set on fire; and on the 30th two more and heavier vessels were authorized. The naval committee was doubled and made general managers of naval matters, subject to final decision by Congress, which appointed the officers down to third lieutenant — the «patronage» question being as burning here as in the Continental army. The beginnings of the American navy were curiously inauspicious for a nation of skilful and daring seamen, and for a body with so brilliant a subsequent record. The officers were largely incompetent, and the men mutinous. A brilliant exception was Captain Manly of the schooner *Lee,* who captured several prizes, including a brig loaded with heavy guns, mortars and tools. Finally, on 25 Nov. 1775, Congress gave up the grisly pretense of being at loyal peace with Great Britain, and declared all ships of war employed against the colonies, and all supply tenders for them, lawful prize; authorized privateering and colonial courts to try prizes; adopted rules and regulations for a Continental navy; and on 13 December directed the marine committee to build and fit out five 32-gun frigates, five 28's and three 24's, by April next. These were estimated to cost $866,666.66, and were to be built at the leading colonial ports from Portsmouth to Baltimore, and elsewhere (Norfolk, Charleston, etc.), if thought advisable. Other vessels might be bought and equipped. On 22 December Esek Hopkins was made commander-in-chief. Among the first lieutenants was John Paul Jones. On 9 November two battalions of marines were authorized. By January eight cruisers had been collected at Philadelphia, and Commodore Hopkins started on a cruise, but was detained six weeks by the ice, and only got clear 17 February. He had been instructed to "annoy the enemy's ships upon the coasts of the Southern States"; but finding nothing of Dunmore's squadron, sailed to New Providence in the Bahamas, where a quantity of British military supplies were stored, stormed the place, and carried off a quantity of stores and 80 cannon, besides the governor and some leading citizens as hostages. On his return he fell in with some armed vessels, which he captured, and the 20-gun frigate *Glasgow,* which, after a spirited fight, escaped. Congress held an inquiry into Hopkins' conduct in June, decided that he had exceeded his instructions, censured him and finally dismissed him. This did not encourage enterprise, and naval service became unpopular. No new naval commander was appointed, the President afterward being given that rank. The vessels, however, did some clever work, and captured many prizes; but the greater part of this service was accomplished by privateers. At the time of the Declaration of Independence our navy consisted of six regularly built war vessels and 19 merchantmen with naval armament, the whole with 422 guns. Against this the British had 78 men-of-war, with 2,078 guns.

Next in importance to the *Bonhomme Richard's* fight with the *Serapis,* the most creditable naval engagement of the war was Benedict Arnold's battle on Lake Champlain. The importance of the naval battles on this inland lake is hardly realizable now; but till the time of railroads the lake was the one route for a large invading expedition between Canada and New York or New England, enabling supplies to be transported where otherwise the mountains or the forests would have made it impracticable. The English had 29 vessels with 89 guns; four longboats with stores; 697 men of the regular navy; and Indian allies. Arnold had 15 vastly inferior vessels, with 88 lighter guns, and about 750 men ignorant of naval service. Several of Arnold's vessels had to be abandoned and destroyed; two were captured; but several were saved in spots the English could not reach, by Arnold's heroic risk of himself. The British loss was about 40, the American about 80. But the battle lost the British the campaign; the struggle had been so severe that Sir Guy Carleton, the commander, did not venture to assail Ticonderoga, and shortly after retired to winter quarters.

The most famous work done by the navy, however, resulted from commerce-destroying in British waters. Our fleets were nearly as much masters of the English Channel as the English were at the time of the *Armada,* though we never had more than three or four ships there at a time; for the English could not protect their own commerce. No other enemy ever disturbed the marine insurance rates, not even France across the channel; but in a short time now they rose to prohibitive rates, and the companies even refused to insure English bottoms at any premium, so that the Thames was crowded with French vessels. The alarm and fury of the English were shown not only in the execrations of "pirate" which they lavished on the lawfully commissioned war vessels and their captains and crews, and in the barbarous misusage of the latter with which they revenged themselves when they captured any, but in the abiding hereditary tradition of their writers: they then invented false accounts of John Paul Jones, and still term him a "notorious pirate," although he was no more a pirate than Nelson, and much less than Rodney, who even turned pirate on his own people. In 1776–77 the *Lexington* was engaged in this work, and in 1778 was joined by the *Reprisal;* but the former was finally captured and the latter foundered. The *Surprise* was then secretly bought from England and fitted out at Dunkirk; but on her beginning to make captures the English government forced the French by threats to give her up. The *Revenge* was then bought, and became even more successful. But the most magnificent success was won by Jones (see BONHOMME RICHARD), in 1778–79. In the former year he closed a wonderfully successful 28 days' cruise in the *Ranger* — from 10 April to 8 May — by capturing the *Drake,* a more powerful vessel than his own. In the latter the marvelous engagement of the *Bonhomme Richard* with the *Serapis,* the most creditable naval victory of the war, dwarfs all else. See JONES, JOHN PAUL.

Meantime Congress had ordered the construction of three 74-gun men-of-war, five large frigates and one or two smaller vessels; but as money ran short, they were never finished. At the end of 1778 the navy consisted of four 32-gun ships, two 28's, one 24, one 20, three 18's, one 12 and one 10 — 14 in all, with 332 guns; while England had on the American coast 89 ships with 2,576 guns. In 1779 the most notable events were the capture on 7 May of seven transports with about 50 guns and some 300 men, by a Boston squadron under Capt. J. B. Hopkins, son of the ex-commodore; that of eight prizes worth over $1,000,000, in July; that in August, by two Continental vessels on a short cruise, of six prizes with 54 guns; and on 7 May, the same day as the first, a most bloody and desperate action of an hour between two 12-gun brigs, the United States *Providence* and the British *Diligent,* in which the latter lost 8 killed and 19 wounded out of a crew of 53, or over half. In 1779 and 1780 Capt. John F. Williams won two brilliant victories in 14-gun and 18-gun Massachusetts State vessels. But on 13 Aug. 1779 a heavy disaster befell the waning little Continental navy. Three vessels, a 32, a 14 and a 12, accompanied a fleet of Massachusetts privateers to dislodge the English from a fort near the mouth of the Penobscot; but, seven English war-ships coming up to reinforce the three already there, the privateers fled, and the Continental vessels had to be run up the river and destroyed. By the fall of Charleston four more — two 28's, a 24, and the celebrated 18-gun sloop *Ranger* — were captured or destroyed; another had been lost; and at the end of 1779 the navy had but six vessels left, so that it was very hard to run the English blockade. Officers and seamen were scarce also; for the English dreaded the American privateers and naval destroyers so much, few as they were, that they systematically refused to exchange prisoners, and connived at the destruction of the Americans in pestilential hulks or prisons. In October 1780 the *Saratoga,* after taking three prizes, which were recaptured, foundered; and in 1781 the *Trumbull* was captured after a fight against superior force in which she was crippled. But the small remnant still won some victories. The *Alliance* on 28 May 1781 captured a 16-gun and a 14-gun brig; and early in 1782 the *Deane* captured four vessels with 48 guns. In April 1782 was fought a very brilliant action by a privateer, one of the most remarkable of the war: the Pennsylvania State cruiser *Hyder Ally,* Lieut. Joshua Barney, having 16 6-pounder guns and 110 men, engaged the British sloop-of-war *General Monk* with 20 9-pounders and 136 men. Despite this enormous disparity of force — 96 pounds of metal against 180 pounds — the American vessel forced the British to strike in half an hour, with a loss of 20 killed and 33 wounded, against 4 killed and 11 wounded. Another remarkable contest was won by a private Philadelphia cruiser, the *Congress,* off the Southern coast. She had 20 guns, but was manned almost entirely by landsmen, seamen being unobtainable. On 6 Sept. 1781 she fell in with a British 16-gun sloop-of-war, the *Savage,* with her regular complement of seamen. In about an hour and a half, lying so close that the guns scorched the opposing gunners, and shot were thrown by hand, the British vessel was fairly shot to pieces, and forced to surrender, with a loss of 8 killed and 24 wounded, against 30 of both on the privateer. The last naval fight of the war was between the *Alliance,* Capt. John Barry, and a heavy English ship, which the former drove off during a run to Havana. The Continental vessels lost during the Revolution numbered 24, with 470 guns. The British loss was 102, with 2,622 guns. The American navy and the privateers together captured about 800 prizes from the British. British privateers did not capture a single Continental vessel; American privateers captured 16 English cruisers, with 226 guns. Consult Maclay, 'History of the American Navy' (Vol. I, 1893); Cooper, 'History of the Navy of the United States' (1839). See NAVY OF THE UNITED STATES.

CONTINENTAL SHELF, that part of the ocean bottom covered with shallow water, and extending from the littoral belt out to the 100 fathom line. Beyond this line lies the continental slope, or edge of the continental block, merging into the abysmal seas. The sediments that accumulate on the shelf are often called shoal water deposits. Those that accumulate on the continental slope are termed aktian deposits, and this belt is sometimes called the aktian belt. The sediments of the deep sea are termed abysmal deposits.

CONTINENTAL SYSTEM, a plan devised by Napoleon to exclude Great Britain from all intercourse with the continent of Europe and thus compelling her to acknowledge the maritime law as established at the Peace of Utrecht. The history of the continental system began with the famous decree of Berlin of 21 Nov. 1806, by which the British Islands were declared to be in a state of blockade; all commerce, intercourse and correspondence were prohibited; every Briton found in France, or a country occupied by French troops, was declared a prisoner of war; all property belonging to Britons was accounted fair prize, and all trade in British goods was entirely prohibited. No vessel coming directly from Great Britain or British colonies, or which had been there since the publication of the edict, was to be admitted into any harbor, and all vessels attempting to avoid this edict by false declarations were to be confiscated, with all their goods, as British. The reasons assigned for this decree were, that Great Britain did not acknowledge the international law accepted by civilized nations, but treated every individual belonging to the country of the enemy as if found in arms; made even the crews of merchantmen prisoners of war; extended the right of conquest over merchantment and private property, and the right of blockade over places and harbors not fortified; over the mouths of rivers; nay, over whole coasts and countries. But many of these measures had always been taken, in maritime ways, even by France herself, as long as she had the means. One great reason for this and all the subsequent decrees of Napoleon was that he considered Great Britain his inveterate enemy and the enemy of the political doctrines which took their rise from the Revolution.

Great Britain immediately directed reprisals against the Berlin decree, first by an order in council of 7 Jan. 1807, by which all neutral vessels were prohibited to sail from one port to another belonging to France, or one of her allies, or to a nation so much under her control that British vessels could not have intercourse with it. Every neutral vessel which should violate this order was to be confiscated with her cargo. A second decree of 11 Nov. 1807 was much more oppressive to commerce. By this all harbors and places of France and her allies in Europe and the colonies, as likewise every country with which Great Britain was at war, and from which the British flag was excluded, were subjected to the same restrictions as if they were closely blockaded; all commerce in the manufactures and productions of such countries was prohibited, and vessels engaged in such commerce were to be confiscated, as also all those vessels whose certificates showed that they were built in the enemy's country. Another order in council declared the sale of vessels by the enemy to neutrals unlawful, and the intended transfer of property void.

Hardly were these orders promulgated when France made counter-reprisals. By a decree of Milan of 17 Dec. 1807, aggravated by a decree of the Tuileries 11 Jan. 1808, every vessel, of whatsoever flag, which had been searched by a British vessel, and consented to be sent to Great Britain, or had paid any duty whatever to Great Britain, was to be declared denationalized, and to have become British property; and in every case such denationalized vessel, as also those which had broken the blockade declared against the Ionian Islands, or had sailed from a British harbor or British colony, or those of a country occupied by the British, or which were destined for any such ports, were declared good prize. By the Treaty of Tilsit (1807) Russia consented to close her ports to English commerce. In order the more effectually to annihilate the British commerce, the tariff of Trianon, respecting colonial goods, was proclaimed 3 Aug. 1810. This was extended by another decree of 12 September of the same year, and both were followed by the decree of Fontainebleau, 18 October of the same year, directing the burning of all British goods. These decrees were to be executed with more or fewer modifications in all countries connected with France. The consequence was that the price of colonial goods rose enormously; a regular smuggling trade was carried on at different points; for instance, at Heligoland, which was sometimes so crowded with persons concerned in this business that a ducat was paid for a barrel to sleep in; thousands of substitutes for colonial goods, particularly for coffee and sugar, were invented, and a variety of manufactures grew up on the Continent which were the germs of very extensive and flourishing branches of industry. The system was abolished immediately after the fall of Napoleon. But its continuance on the English side was one of the causes of the War of 1812. Consult Mahan, ‹The Influence of Sea Power on the French Revolution and Empire› (Boston 1894); Thiers, ‹Histoire du consulat et de l'empire› (Paris 1845–62); Cime, ‹Etude sur les tarifs de douane et les traités de commerce› (Paris 1875); Adams, Henry, ‹History of the United States› (New York (1889–91).

CONTINENTALS, or CONTINENTAL ARMY, the army of the United States during the Revolution. In May 1775, after the battle of Lexington, the Provincial Congress of Massachusetts requested the Continental Congress to assume control of the forces which had gathered around Boston. Further outside pressure led the latter Congress in June to vote for raising a «Continental army» (the name «Continental» in all these cases expresses the hope, long entertained, that Canada would join the revolt), and for a loan of $2,000,000 to support it. On the 15th George Washington was appointed commander-in-chief; then four major-generals were appointed, Artemas Ward, Charles Lee, Philip Schuyler and Israel Putnam; and an adjutant-general, Horatio Gates. Lee and Gates were bitterly opposed in Congress, and were only confirmed by Washington's influence, as men of approved military capacity. It is curious that Congress was right and Washington wrong, and that Lee's treachery and Gates' incompetence and intrigue nearly ruined the cause and Washington together. The brigadiers appointed were general officers in colonial service, with two others; and the inferior colonial officers were confirmed in their rank and shortly given Continental commissions. For commissary-general was chosen Joseph Trumbull, son of the governor of Connecticut, Washington's right-hand man and adviser, who kept a great general store in Lebanon. There was a further reason for this. The food surplus of the country came mainly from three great valleys,—the Connecticut, the Hudson and the Delaware; the last two were held by, or liable to raids from the British during most of the war, and the Connecticut Valley was the one rich farming country which the British could not molest. Hence the first two commissary-generals were both Connecticut merchants. Washington appointed his aide, Thomas Mifflin of Pennsylvania, quartermaster-general; and Dr. Benjamin Church of Boston was made director of the army hospital. There was no paymaster-general till late in 1776, when William Palfrey of Boston was appointed. On 12 June 1776 Congress voted to appoint a «Board of War and Ordnance» of five members; in 1777 this was changed to a «Board of War,» to consist of three persons not members of Congress. This board has not left an enviable historical reputation; but it lacked neither ability nor patriotism. In part its troubles were due to civilian misunderstanding of and contempt for military claims and feelings; in part to the insistence by the States on their share of army patronage, as now of civil patronage, which drove some of the best generals from the service and contributed to Arnold's treason.

The army was constituted by taking into colonial pay the militia regiments of the various colonies, and enlisting others for a year. The number on the war office rolls during 1775 was 27,443, besides an estimate of 10,180 militia for a few months' service during 1776, 46,891 regulars, 16,700 militia as before. Had these all been in the field and good troops, and well equipped, they would have been fairly sufficient, though not what could or should have been raised; but half or more were on paper, the material was poor, the equipment insufficient and the whole system incompatible with effectiveness. The term of enlistment was too short for the soldiers to learn their business; the militia absolutely refused to submit to discipline, and their insubordination affected the regulars. Washington during the campaigns of 1776 urged upon Congress a plan for a permanent army; that body sent a committee to the camp at Harlem Heights, and drew up a scheme generally in accord with his views, which Congress adopted. The «armies» of different sections were to be consolidated into one body, of 88 battalions with 750 men each, to be raised in the States according to population and resources; besides a Canadian regiment to be called «Congress' Own.» The largest numbers, 15 battalions each, were to come from Massachusetts and Virginia. The men were to be enlisted for the war, with a bounty of 100 acres of land each at the end; officers, higher amounts; colonels, 500; and $20 bounty for each recruit. The States were to enlist their quotas, arm and equip them; and to appoint the officers from colonel down though Congress was to commission them. But the plan worked slowly and poorly. Enlistments for the war were so few that a three years' term was substituted; to stimulate even these, Massachusetts began and other States continued the policy of greatly increasing the bounties, and towns and counties bid still higher; but this rather made the process slower, men waiting to see how high the bids would go. Washington was shortly invested with dictatorial powers to remove any officers under brigadier, and fill the vacancies at his discretion; and allowed to raise 16 extra battalions. This somewhat strengthened his scanty lines, and enabled him in a slight degree to rectify the mischief done by the State patronage, give commissions to good officers, and keep others from retiring. But even so, and despite incessant drafts from the militia, the total number of soldiers enrolled in 1777 was but 34,820 regulars and 10,100 militia; in 1778, 32,899 and 4,353; in 1779, 27,699 and 5,135; in 1780, when the Carolinas and Georgia were in British hands, and none of their troops were on the roll, 21,015 and 5,811; in 1781, when Cornwallis surrendered, 13,292 and 7,298. It would seem that if the British could have held out a little longer, or sent one more army to America, the Continental army would have melted into nothing without the country taking pains to keep it up.

The reason was not lack of men, nor any ruinous exhaustion of resources; it was simple administrative anarchy (see Confederation, Articles of), which could not collect and distribute the resources we possessed, and which left the soldiers half fed, less than half clothed, and for long periods unpaid. This was increased by a jealous dread of the army itself (see Cincinnati, Society of the), bred by historical experience which they had as yet no other to countervail; they appreciated victories, but were not inclined to pinch themselves for daily supplies. In 1777 the soldiers' back pay was settled up in Continental money, at about 12 for one, though Massachusetts made good a part of the depreciation. Arrears steadily accumulated till the end of the war, though in 1778–79 a half-pay system for seven years was provided for the officers, and a gratuity of $80 for the men. In January 1781, the Pennsylvania regulars struck, and were pacified with difficulty and by certificates for their pay; the New Jersey troops followed suit; and Congress in alarm made requisition on the States for $879,342 to pay the arrears. About half the amount came in, and Massachusetts and New Hampshire sent gratuities to their men; but the rest lagged. About this time the Articles of Confederation were adopted, making the consent of nine States necessary for appropriations; Congress was even more helpless than before; and as the time of a general disbandment drew near, the officers began to fear that it was intended to turn them off without paying them, and if they did not receive it while in the field they never would. Meantime Congress was debating the subject. The later Federalist party wished to fund the army dues as well as the other public debt, and give the army interest-bearing certificates; the decentralizers wished to leave it to the States to settle each with their own troops. The officers, finding the half-pay project highly unpopular, wished to commute it for a lump sum, in cash or securities. About this time, 10 March 1783, an anonymous letter called a meeting of the officers in camp at Newburg, and an anonymous address suggested that if Congress refused justice, they should desert the country in a body, under Washington's lead. Washington denounced this call as seditious, but called a meeting himself, at which his influence kept patriotism uppermost; but he wrote urgently to Congress, and it finally agreed to commute the half-pay into five years' full pay in certificates at 6 per cent interest. The States were very indignant at this, New England especially denouncing the whole scheme of half-pay: the Massachusetts legislature passed a resolution that it tended to "raise and exalt some citizens in wealth and grandeur to the injury and oppression of others." The soldiers were furloughed on three months' pay till the British should evacuate New York, when they were discharged. The number of troops nominally furnished by each State is as follows:

Massachusetts, 69,907; Connecticut, 31,939; Virginia, 26,678; Pennsylvania, 25,678; New York, 17,781; Maryland, 13,912; New Hampshire, 12,497; New Jersey, 10,726; North Carolina, 7,263; South Carolina, 6,417; Rhode Island, 5,908; Georgia, 2,679; Delaware, 2,386. Total, 231,791. Adjutant-generals: Horatio Gates of New York, Joseph Reed of Pennsylvania, Timothy Pickering of Massachusetts, Alexander Scammell of New Hampshire, Edward Hand of Pennsylvania. Quartermaster-generals: Thomas Mifflin of Pennsylvania, Stephen Moylan of Pennsylvania, Mifflin again, Nathanael Greene of Rhode Island, Timothy Pickering of Massachusetts. Commissary-generals: Joseph Trumbull of Connecticut, Jeremiah Wadsworth of Connecticut, Ephraim Blaine of Pennsylvania. Director-generals of hospitals: Benjamin Church of Massachusetts, John Morgan of Pennsylvania, William Shippen of Pennsylvania, John Cochran of New Jersey. Paymaster-generals: William Palfrey of Massachusetts, William Pierce of Georgia. Inspector-generals: Thomas Conway, Baron Steuben. Chief engineers: Louis L. Du Portail, Thaddeus Kosciusko. See Army of the United States.

CONTINGENT, a name often given to the quota of troops furnished by each member of a number of states composing a federation, or by each organization forming an army or navy.

CONTINUATION SCHOOLS, the term applied to those systems of training which are adapted to people already at work in business or industry, especially for girls and boys between the ages of 14 and 18. The original purpose of the schools was to provide that general education of which forced entrance into business at an early age deprived the workers. The development of the schools has been chiefly along the lines of substitution of further industrial training in place of the general education and of day in place of night classes. The movement began in Germany where such schools in some form existed for many decades, their general and national character having been developed since 1870. They are voluntary — it is left entirely to the discretion of each local authority whether such a continuation school be established and the form, within reasonable limits, it may take. Two clauses in the Imperial Industrial Law of 1891 provide a limited measure of agreement. Clause 120 requires employers of labor to grant to employees under 18 the necessary time to attend continuation classes in the daytime. Classes on Sunday are only permitted in exceptional cases. Clause 142 allows (but does not compel) a local authority to make attendance at a continuation school obligatory for all males under 18 not attending an approved secondary or trade school, and throws the responsibility for such attendance on the scholar's parent or employer, usually on the latter. Since 1891 the system has spread in all sections of Germany and become practically obligatory. Girls are brought within the scheme, but almost always for domestic training only. Apparently two distinct lines of thought control the authorities. On the one hand, it is held that teaching should be definitely vocational — that is, specifically applied to the scholar's chosen calling. On the other, such a program of teaching is preferred as is calculated to produce a good citizen. The one demands technical skill, the other general efficiency. The former has moved in the direction of elaborately-equipped trade continuation school buildings. The latter is a very numerous class, especially in Prussia, and has hitherto been content with makeshift arrangements in elementary school buildings.

Two distinct types of buildings have been evolved. Examples of the first may be seen in the central continuation school at Bonn and in the central and northern continuation schools at Frankfort-on-Main. All erected within the last eight years, in none is there any trade teaching properly called. The first contains rooms for cookery and type-setting, the second a number of spare rooms in the basement eventually to be utilized for workshops, and the third rooms for cookery. In Bonn boys and girls are taught in the same building; in Frankfort they are separated. There is ample provision for the teaching of applied drawing and applied science; but most significant in these three examples is the generous provision for recreation. There are large rooms, artistically decorated and well furnished, where concerts and dances are held and lectures given on Sundays and in the evenings, as well as smaller rooms or alcoves for reading and games. In Munich, where trade-teaching is more conspicuously developed, is less external evidence of this social side of school life, and the buildings approximate very closely to the ordinary technical-school type. But Munich in providing scattered district schools obviates as far as possible the long journeys and waste of time involved by a huge central building.

In England continuation schools, chiefly in the form of evening classes, have spread more and more. They are not obligatory. Owing probably to the lack of expert teachers, the system has not proved as satisfactory as desired, but its weak points will be improved in time. In the United States, the plan has been adopted in many cities with considerable success and is a hopeful feature of American education. It adapts itself largely to local needs and admits of varied forms. Another happy feature is the prominence attached to the teaching of foreigners chiefly in evenings as an integral part of the course. The employers of large corporations, recognizing the value of further training, often provide such schools within their own establishments. Ireland has a form of continuation school, which has made some headway since 1915, due to the Catholic Working Boys Technical Aid Association of Dublin which organizes social centres and continuation classes throughout Ireland.

Bibliography.— Consult Pache, O., 'Handbuch des deutschen Fortbildungsschulwesens' (Wittenberg 1896-1902); Jones, A. J., 'Continuation Schools in the United States' (Washington 1907); Sadler, M. E., 'Continuation Schools in England and Elsewhere' (Manchester 1908); Ware, F., 'Educational Foundations of Trade and Industry' (New York 1901); Spranger, E., 'The Significance of the Continuation School for the Educational System' (trans. by Porterfield in *Educational Review*, Vol. 42, No. 1); Kirschensteiner, G. M. A., 'The Schools and the Nation' (trans. by C. K. Ogden, London 1914).

CONTINUITY OF STATE OF MATTER. See CRITICAL POINT.

CONTINUOUS VOYAGE. The doctrine of continuous voyage in international law was invented by Lord Stowell in the early part of the 19th century to meet the case of neutral vessels which, in the war between Great Britain and France, endeavored to evade the rule prohibiting neutrals from engaging in the enemy's carrying trade. This evasion was sought by interposing a neutral port between the point of departure and the forbidden destination. It being unlawful for neutral vessels to trade between a French colonial port and a home port in France they attempted to legalize the voyage by breaking it at a neutral port, usually in the United States. Lord Stowell held, however, that the two voyages were in effect one and the same, and therefore illegal, although each separate voyage was in itself legal. During the Crimean War the French prize courts extended the doctrine of continuous voyage to the carriage of contraband and such cargoes, bound from one neutral port to another, were condemned whenever the evidence showed that the ultimate destination was in fact a port of the enemy. During the American Civil War the courts of the United States applied the doctrine on a large scale, likewise, to the carriage of contraband and blockade running. Thus British ships, with their cargoes, bound from England to the neutral ports of Nassau or Matamoras, were condemned whenever the evidence showed that the eventual destination was not a neutral port but in reality a port in the Confederacy. British writers on international law unanimously denied the legality of such an extension of the doctrine of continuous voyage and the British prize courts took the same view. Thus in the case of the *Immina* decided at the end of the 18th century, Lord Stowell refused to condemn a vessel bound from Dantzic to Emden, both neutral ports, notwithstanding the fact that Emden was situated only five miles from the frontier of Holland, a country with which England was then at war and although it was notorious that the goods were to be reforwarded from Emden to the enemy country. During the Boer War, however, Great Britain for the first time abandoned her early attitude and undertook to apply the rule which her courts and text writers had formerly condemned, and seized a number of German vessels bound for the neutral port of Lorenzo Marquez in Delagoa Bay, on the ground that the real destination of the cargoes was enemy territory (The Boer Republics). During the European War the doctrine of continuous voyage was applied by Great Britain on an extensive scale to the carriage of goods between the United States and the ports of various neutral countries adjacent to Germany and Austria. The Declaration of London sanctions the extension of the doctrine of continuous voyage to the transportation of *absolute* contraband but forbids it in the case of *conditional* contraband, except where the belligerent has no sea board. Likewise it forbids the application of the rule to blockade running. Article 35 of the Declaration lays down the rule that conditional contraband is not liable to capture except when found on board a vessel bound for territory belonging to or occupied by the enemy, or for the armed forces of the enemy, and when it is not to be discharged at an intervening port. But the British order in council of 29 Oct. 1914 modified this provision so as to extend the rule of continuous voyage to the carriage of conditional contraband and also reversed the established rule by placing on the owner rather than upon the captor the burden of proving an innocent destination. The effect of the order in council was to obliterate the distinction between absolute and conditional contraband — a distinction which had already been largely abolished by putting on the list of absolute contraband many articles which were not so by their nature. The American and other neutral governments protested against the extension of the doctrine of continuous voyage to the carriage of articles of conditional contraband between neutral ports and the establishment of presumptions of hostile destination which, it declared, were based on suspicion rather than upon evidence. Cargoes of conditional contraband shipped from American ports to the ports of Denmark, Holland, Norway and Sweden, it was argued, could not lawfully be presumed to be intended for the use of the enemy. There was a large local demand in all these countries for such goods — a demand which had been largely increased by the cutting off of their European sources of supply on account of the war — and it was impossible to admit the right of a belligerent to determine what proportion of such shipments were intended for local consumption and what proportion was intended to be forwarded for the use of the enemy. If after such goods were delivered and became a part of the common stock of the neutral, they were subsequently resold and reforwarded to a belligerent, it was in consequence of a new destination and the doctrine of continuous voyage did not apply.

To this argument the British government replied that it was unable to admit the contention that if a belligerent was so circumstanced that his commerce could pass through adjacent neutral ports as easily as through ports in his own territory, his opponent had no right to intercept such commerce. The position of Great Britain was analogous to that of the United States during the Civil War; the enemy was flanked by neutral countries through whose ports a steady stream of supplies was pouring in for the use of the enemy, and following the practice of the United States during the Civil War, Great Britain was endeavoring to cut off this supply by extending to its carriage the doctrine of continuous voyage, that is, it was endeavoring to prohibit neutrals from doing indirectly what they could not do directly. Under the circumstances the right of blockade and the right to capture contraband goods going to the enemy would be largely illusory unless the injured belligerent were allowed to apply the rule of continuous voyage to such traffic and seize cargoes whose ostensible destination was neutral territory but whose real destination was armed forces of the enemy. Manifestly the right of a belligerent to thus interfere with trade between neutral countries involves a serious encroachment on the rights of neutrals, but so long as the right of belligerents to blockade the ports of the enemy and intercept contraband trade between them and neutrals is admitted it would seem difficult to deny their right to apply a rule without which the weapons of blockade and contraband would in many cases be worthless. (See also BLOCKADE; CONTRABAND; SEARCH, RIGHT OF). Consult the authorities cited under BLOCKADE; CONTRABAND; and RIGHT OF SEARCH.

JAMES W. GARNER,
Professor of Political Science, University of Illinois.

CONTORNIATI, kŏn-tôr-nē-ä'tē, ancient medals which have occupied the attention of antiquarians for a long time, and, on account of their rarity, are highly esteemed in cabinets. They are formed of a thin plate of metal (not of two different sorts, as is often supposed) with a flat impression. They differ from other ancient coins by having a furrow upon both their sides, where the others have a wreath of pearls. These hollowed lines (It. *contorni*) may have occasioned their name. Another characteristic of genuine *contorniati* is a cipher composed of the letters EP or PE, of which no satisfactory explanation has as yet been discovered, together with numerous impressed characters, and a great number of palm branches, the cavities of which are often filled with silver. They are also added by a second hand, and thereby are essentially distinguished from the «monograms,» so called in the language of the mint. They resemble the *signa incusa* (*contremarques*) on the Roman medals. All the *contorniati* are of bronze, and equal in size to the large bronze coins called *medaglioncini* by the Italian collectors. Their form is various, their workmanship rude and their inscriptions are frequently different from the usual curial style upon the ancient coins. From these circumstances we may conclude that they did not belong to the age of the Roman emperors whose image they bear, but to a later one. Eckel, in his masterly treatise on the contorniati, follows the opinion of Morelli and Mahudel, who consider them to have been made from the reign of Constantine the Great to that of Valentinian. It has been ascertained that they were not struck by public authority; and the ancients have transmitted no account of their destination, which must, therefore, be left to conjecture. The frequent representations of race-grounds, palms, men shouting to the charioteers, and even the images of the emperors upon them, make it probable that they were distributed as tickets of admission or as certificates to successful competitors in the games at the circuses in Rome and Constantinople. Consult Smith, ‘Dictionary of Greek and Roman Antiquities.’

CONTOUR, kŏn'toor, the outline or defining line of any figure or body; also the horizontal outline of works of defense. When the conformation of the ground or works is described by contours or horizontal sections, these sections are taken at some fixed vertical interval from each other suited to the scale of the drawing or the subject in hand, and the distances of the surface at each interval above or below some assumed plane of comparison (usually sea-level) are given in figures at the most convenient places on the map. The contour lines, that is, represent the shore lines that a rise in the ocean would cause it to assume. Of course, embayments of this shore line correspond to valleys that would be drowned, and promontories to ridges. Contour lines close together mean that a considerable rise in the sea-level would have a comparatively slight effect in pushing back the shore line, which must therefore be situated on very steep ground. As water always flows down hill by the steepest path, and as a line squarely across the contour lines will meet more of them in a given interval than one that meets them slantingly, it is clear that the lines by which the rain is carried off the ground meet all the contour lines at right angles, and that consequently the streams must do likewise. This relation between streams and contour lines, coupled with the fact that streams flow along the bottoms of valleys, and consequently pass through the inmost points of embayments in the contour lines, is of the utmost value to the topographer, who always bases his contouring of a region on its drainage.

Two contour lines cannot cross except where there is an overhanging cliff. A contour line cannot terminate; it must either be closed or run off the map. A closed contour line either encloses a hill-top or a depression, which in general has no stream leading from it. Such depressions are rare except in very dry climates, and even there usually contain a salt lake or marsh, so that confusion between hills and valleys is not likely to arise in reading the map.

It is possible to determine within fairly close limits whether of two points given on a contour map one is visible from the other. This is one reason for the immense superiority of contour maps over all others in military operations.

The contour interval varies according to the scale and purpose of the map and the nature of the terrain. In the United States army, maps with a scale of 12 inches to the mile are supposed to have a contour interval of five feet; those with a scale of six inches to the mile have a contour interval of 10 feet; those with a scale of three inches to the mile have a contour interval of 20 feet, and those with a scale of one inch to the mile have a contour interval of 60 feet. This makes the distance between the contour lines dependent only on the mean slope of the ground and not on the scale of the map. In mountainous country, however, the contour intervals may have to be doubled or trebled to obtain a legible map. See MAP; SURVEYING; and the map of a part of the Housatonic quadrangle in GEOLOGICAL SURVEY.

CONTRABAND. Contraband (from *contra bannum* or *bandum*, contrary to the ban or edict), is a term applied to certain articles which international law allows a belligerent to seize and confiscate even when found on neutral vessels, and which are being transported for the use of the enemy. By means of a blockade (q.v.) a belligerent may cut off *all* neutral trade and intercourse with his enemy; through his power to capture contraband goods he may prevent neutrals from furnishing the enemy with such goods as by the law of nations are regarded as contraband. These are the two principal weapons which international law places in the hands of belligerents for cutting off the over-sea commerce of their enemies, the effectiveness of each depending, of course, upon the sea power of the belligerent which employs them. Both may be resorted to at the same time, and in the hands of a nation which controls the seas they may become a means of reducing the enemy to starvation and thus compel him to surrender. International law, however, allows the citizens or subjects of neutral powers to carry on at their risk contraband trade with either or all belligerents, subject to the rights of the injured belligerent to capture and confiscate all such articles as fall within the category of the contraband. Their government is not bound to prohibit them from engaging in such traffic; on the other hand, it is not their duty to intervene to protect them from losses which they may sustain from having their goods captured by one of the belligerents.

Different governments have held different views as to what articles properly fall within the category of contraband and the policy of the same state has not infrequently varied from time to time, sometimes quite inconsistently. Grotius, the first great writer on the law of nations, classified articles into three groups: first, absolute contraband, or those used exclusively for war purposes; second, innocent goods, or those incapable of being used at all for military purposes; and third, conditional contraband, or those susceptible of being used both for purposes of peace and war. This classification has in practice been generally observed by belligerents, although there has been no agreement as to what articles fall in each class. The subject was discussed at the second Hague conference in 1907, but no decision was reached. It was again considered at the London Naval Conference of 1908–09 with more success, but the declaration adopted by the conference has not been ratified by any of the governments there represented. At the outbreak of the European War most of the maritime powers of Europe put the Declaration into effect with certain modifications, some of which related to the subject of contraband. The Declaration, although unratified, represents the nearest approach to an agreement among the maritime powers that has ever been reached. It enumerates a list of articles embracing such things as arms, munitions, armor plates, warships, military clothing and harness, pack and draft animals, etc., which are declared to be absolute contraband. In the second place it contains a list of articles declared to be conditional contraband, and embracing such things as food-stuffs, cloth, coin, vehicles, air-craft, fuel, barbed wire, horseshoes, field glasses, etc.; and the third group embraces various articles which are declared not to be contraband at all, such as raw cotton, wool, silk, flax, hemp, rubber, rosin, rawhides, metallic ores, paper, soap, agricultural machinery, precious stones, clocks, feathers, etc. These lists, however, are not considered as absolutely fixed, for article 23 of the Declaration allows belligerents to add other articles used "exclusively for war purposes" to the list of absolute contraband, and article 25 permits similar additions to be made to the list of conditional contraband. It does not, however, permit the placing on the list of absolute contraband of articles which are susceptible of both innocent and warlike use nor does it allow belligerents to treat as contraband, either absolute or conditional, articles which are susceptible only of innocent use. The disregard of this rule by the entente allies during the European War in treating cotton, air-craft, copper, rubber, glycerine, zinc, lead, wool, tin, castor oil, and various other commodities as absolute contraband evoked a protest from the German government and was the subject of complaint in the United States and other neutral countries.

The rule governing the liability of contraband to capture varies according to whether the goods belong to the class of absolute or conditional contraband. Under the Declaration of London absolute contraband is liable to capture if it is destined to any place within the enemy country or the territory occupied by him; on the other hand, conditional contraband is liable to capture only when destined for the use of the armed forces or for the government of the enemy state, but it is presumed to be destined, when the goods are consigned to the enemy authorities, to a government contractor or to a fortified place or a naval base within the enemy country. These and other rules of the Declaration are admittedly unsatisfactory. The presumptions which it establishes in regard to hostile destination are vague; nothing is gained by condemning conditional contraband goods destined to a government contractor and allowing those consigned to a private merchant to go free, since the latter can sell to the government as readily as the former may; again every important port is fortified, yet the existence of fortifications is no indication as to the ultimate use of the goods; almost every place in this age of railways may serve as a "base" of supplies; finally nothing is gained by preventing an enemy from obtaining supplies from a "fortified" place, a "base" or from a government "contractor" when he may obtain them with equal readiness from private dealers, through the power of requisition. The penalty for carrying contraband is the confiscation of the goods; likewise, the vessel carrying the goods may according to the Declaration of London be condemned if the contraband constitutes more than half the cargo. Whether the captor may sink the ship with its cargo if he cannot take it in to a home port was raised during the Russo-Japanese War in 1904 when the Russians sank the *Knight Commander*, a British vessel laden with contraband goods destined for Japan. The British government denied the legality of the act and demanded the payment of an indemnity by the Russian government. The sinking by a German cruiser during the European War of the American sailing vessel *William P. Frye*, laden with grain destined for England, evoked a protest from the government of the United States. In consequence of treaty stipulations between the United States and Germany, the German government agreed to compensate the owners of the vessel. But in the case of the *Maria*, a Dutch vessel carrying contraband to England and sunk by a German cruiser, the German government declined to make compensation to the owners of the ship, there being no treaty between Germany and the Netherlands similar to that between Germany and the United States. Many other neutral vessels laden with contraband have been sunk by German naval commanders.

Inasmuch as the majority of controversies between belligerents and neutrals are usually connected with trade in contraband and in view of the lack of agreement concerning what is and what is not contraband, it has been proposed to abolish the right of belligerents to interfere with such trade and to leave them merely the right of blockade. Such a proposal was made by the British delegation at the second Hague conference in 1907. The supporters of the British proposal pointed out that the right to interfere with trade between neutrals and belligerents is out of harmony with modern conditions; that the number and variety of contraband articles have greatly increased; that the increased size of ships has made search on the high seas more and more difficult, thus necessitating the taking of them in to distant ports and subjecting shippers to ruinous delays; and that improved railway facilities have made it impossible to prevent contraband from reaching belligerents. As evidence of the growing dissatisfaction with the existing rules in respect to the right of belligerents over contraband trade, it may be remarked that the British proposal received the support of 26 of the 35 states which voted on the proposition, only five voting against it. Another proposal which has been widely approved is the abolition of conditional contraband and the substitution of a single list of articles, by general agreement, these to be liable to capture if consigned to any person or place in the enemy country. See Continuous Voyage; Search, Right of; Blockade.

Bibliography.— In addition to the treatises cited under International Law, consult Atherly-Jones, 'Commerce in War'; Bentwich, 'The Declaration of London'; Cohen, 'The Declaration of London'; Kleen, 'De la contrebande de guerre'; Pyke, 'Contraband of War'; Von Ferneck, 'Die Kriegskonterbande.'

James W. Garner.

CONTRABASS. See Double Bass.

CONTRACT. Of the positive rules obeyed by men, in a society which has reached the stage in which we live, the greater part are made by contract; the lesser only are made by imperative law. Indeed, the speculative and philosophical writers of the 18th century on sociology and politics, under the influence of Montesquieu and Rousseau, were filled with a notion of a "social contract" as the origin of law. Obedient to the impulse thus given, they assumed that the form of contract resting upon the mere consent of the parties was the original. The assumption was the outcome of their reasoning that social development began with a state of nature, in which innocence and simplicity prevailed, to a state of increasing complexity and sophistication. Accordingly the simpler forms were believed to pertain to the older and more natural order of society. The history of contract shows the truth to be exactly opposite. The "ceremonial" contract, in which the failure to observe a mere technical formality was fatal to the obligation, is the real original. There is nothing in early times like the interposition of law to compel the fulfilment of a mere promise. The idea of the State intervening to enforce obligations resulting from one man's reliance on the word of another was of slow growth, and its realization was one of the latest fruits of civilization. Early law sanctioned only that promise which was solemnized by a prescribed ceremonial; and, when duly solemnized, a promise became a contract, which the law recognized and would enforce, even though obtained through duress or deception. Informal engagements the Roman lawyers called *pacts*, to distinguish them from "transactions with the copper and balance," which alone were entitled to the name of "contracts." The distinction is observed in our law to this day. The delivery of a clod of earth is no longer an essential in the conveyance of land, but deeds and sealed instruments in general are still differentiated from other contracts; and the distinction is not merely verbal — it is radical, setting "specialties," as sealed contracts are called, in a class apart with respect to their legal validity as well as in their form. A "specialty" or sealed instrument, for instance, "obtains validity from its form alone, not from the fact of agreement or consideration moving"; it cannot be revoked after tender, even though the offer contained therein be not immediately accepted; and one who accepts the tender of a deed assumes the obligations therein imposed on him, even if he have given no expression to his intention to do so. Equity, of course, will give relief from a contract by specialty when obtained by fraud, under duress, etc. All contracts not under seal are called parole contracts. A parole contract may be made in writing or orally. Another distinction which is usually made — that between executed and executory contracts — might probably be eliminated. When a man goes to a jeweler and buys a watch and pays for it, a contract has taken place, but it has been extinguished in the very act of making. He has the watch and the jeweler has the money; each has acquired a right of possession and ownership, one to the cash and the other to the timepiece. These rights were created by a contract, to be sure, but a contractual obligation between them no longer exists,— neither party has any duty to perform to the other. An executed contract calls for no intervention of the law, though the law may be appealed to for the protection of the parties in the rights thereby acquired. The jeweler might have warranted the watch, but that would be a new contract, superadded to the executed contract of sale. The purchaser might have paid for the watch with counterfeit money, but in this event the vendor would have his choice between a reopening of the transaction, thereby making the contract of sale once more an executory contract, or he could pursue his remedy on the new right vested in him by the tort of the vendee. This new right, however, having arisen from an obligation *ex delicto*, the proceeding taken thereon would not be for the enforcement of a contract. The law of contracts, strictly speaking, is concerned only with promises or agreements which remain to be performed in whole or in part — in a word with executory contracts. The very definition of a contract, as "an agreement which creates an obligation," implies the exclusion of agreements all the conditions of which have been fulfilled and which have resulted in the creation of rights *in rem*. An obligation which has been performed is no longer an obligation. A more appropriate distinction than that between executed and executory agreements would be one between contracts which create rights *in rem*, such as rights of possession and ownership enforcible against the whole world, and those which create rights *in personam*, enforcible only against the person obligated.

Law of Contracts.— Almost every conceivable human relation or right may be subject matter of a contract, though contracts contravening public policy would be absolutely void, and not merely voidable for their illegality. A person could not sell himself into slavery, nor make an enforcible agreement to commit a crime; to do an act forbidden by statute, nor to do a civil wrong. The compounding of, or an agreement not to prosecute, a felony, or to procure legislation by corruption, to promote litigation (champerty), etc., would not be contracts; but would be crimes. But an agreement would not be illegal even though the thing agreed to be done should be unwise, unreasonable or absurd. The essentials of a contract are (1) two or more parties, for a man cannot make a contract with himself, and an agreement between two departments of the same corporation would be a nullity; (2) there must be a common intention, which must have been communicated from one party to the other; (3) what is agreed to must be possible and legal; (4) the agreement must have been expressed in some manner, or must be inferable from the acts of the parties; (5) the agreement must either be evidenced by a solemn formality — the sealing and acknowledgment of a bond or a deed; or there must be some fact which affords a motive for the making of it — in the language of the lawyers, "a consideration moving." All agreements spring from an offer and its acceptance. The acceptance must be unconditional, for, if it is conditional, the acceptance is, in effect, a new offer; the minds of the parties have not met and there has been no agreement. Acceptance must be contemporaneous with the offer, or the latter may be withdrawn at any time before it has been accepted. A bid at an auction, for instance, has been held not to bind the bidder until the hammer has fallen. A party making an offer by mail, however, cannot withdraw the same after the party of the other part has sent his acceptance by post; though an offer by mail may be countermanded by telegraph or phone before it has been assented to. An offer made in an instrument under seal cannot be revoked even though not immediately accepted by the party to whom the tender is made. The consensus of the parties must be real. Absence of consent not merely avoids an agreement but renders it a nullity. There is no real consent when one of the two parties does not mean the same thing as the other, or when an unavoidable mistake has been made — as where the object of an agreement does not exist, or where an agreement is made to buy a cargo "to arrive ex *Peerless,*» there being two ships of that name, one of which was intended by the buyer and the other by the seller. Fraudulent misrepresentation, of course, invalidates consent of the defrauded party and vitiates the agreement. Mere exaggerations of a vendor crying his wares are not necessarily fraudulent; representations are fraudulent in law only when made recklessly, with knowledge of their falsity or without belief in their truth. To invalidate consent it must have been materially induced by the misrepresentations. Only where the utmost good faith is required, as where one party stands in a fiduciary relation to another, may even the innocent misrepresentation or non-disclosure of facts invalidate an agreement *ab initio*. When the consent of a party is obtained by undue influence no contract has been made. Threats of injury to or the withholding of property, when made by a person in a position to dictate, constitute undue influence — as, where a banker refuses to honor the check of a customer unless the latter accedes to a false or fraudulent claim; or a water company refuses service unless a promise is made to which it has no right. Consent is nugatory, of course, when given under duress, meaning a threat of bodily harm to the promisor or the restraint of his liberty. The matter agreed upon must be possible of performance as well as legal. An agreement to jump over the moon would not be a contract; but a promise to build an aeroplane that could cross the Atlantic in four days would be, the performance of the promise being, conceivably, possible. A physical impossibility is not necessary; a practical impossibility is sufficient to avoid an agreement — for instance, to recover a ring known to be lying at the bottom of the sea. An agreement which imports to have a legal effect unknown to the law is void. An agreement may be expressed either in writing or orally, or one may be inferred from a course of conduct. The latter is called an «implied contract.» The intention of the parties must have been communicated from one to the other. In an old case of the time of Edward IV it was said by the court in reference to an unexpressed acceptance, «your having it in your own mind is nothing, for it is trite law that the thought of a man is not triable, for even the devil himself does not know what the thought of a man is.» In a developed system of laws it is not necessary that the offer and acceptance be made by the parties face to face. They may be communicated by post or by telegraph or telephone, by messenger or other go-between. A contract made by mail need not be contained in its entirety in one letter and the answer thereto; it may be the outcome of a long correspondence and may be made partly in writing and partly by word of mouth. A contract, unless it be a «specialty,» need not follow any prescribed form, and it may be made through agents. Contracts are sometimes said to be «implied in law.» The term is not happily chosen, for an examination of the cases shows that obligations by legal implication do not spring from contracts at all. For instance, when one receives money which should have been sent to another he is under obligation to turn it over to the person legally entitled thereto. To say that he is under an implied contract to pay is illogical, however,— for, where is the contract? After all the requirements above enumerated have been satisfied, something is still necessary to the making of a legal contract. Either some legally prescribed formality must be observed, as in the case of a sealed instrument; or, in respect to contracts not under seal, there must be a consideration. A parole promise, for which no consideration has passed or is to pass, is a *nudum pactum,* and is unrecognized by the law. No action can be founded on the same. A pecuniary consideration, however, is not necessary to support a parole contract. Any benefit to the party promising or any loss or detriment to the promisee would be a sufficient consideration. The benefit need not flow from promisee to promisor; this or the detriment or loss suffered by the promisee may be to the advantage of a third partv and would still be regarded a good consideration. A promise to do or to forbear doing something would be a good consideration just as would be the deed or the forbearance itself. An offer to perform personal services and acceptance of the offer with a promise to pay for the services would make a mutual contract. The confidence reposed in one who undertakes a service may be a sufficient consideration. Thus, one who was entrusted with the removal of wine casks from one place to another, though without pay, was held to have violated a contract when he performed the task so negligently that damage resulted. On the other hand, the consideration must have some real value. Marriage has been held by our gallant judges to be the most valuable of all considerations; it will give legal support to the most extravagant ante-nuptial promises. The contract of marriage is of any and all classes; it may be ceremonial and formal or merely parole; it is an executed contract in so far as it has resulted in the creation of the marital relation and the legal rights of each of the parties in the property of the other, and it is executory with respect to the obligation of the husband to protect, support and maintain, and of the wife to love, cherish and obey according to the ritual. Contracts to give are usually enforcible only in certain rigidly defined cases; in England such contracts must be entered into by deed. Gifts and other contracts, the performance whereof is one-sided, are called unilateral.

Contracts may be considered as *principal* and *accessory*. Principal contracts may be subdivided, according to their objects, into classes as follows: (1) Alienatory, which includes, besides gifts, all agreements of barter and sale and conveyances of land; (2) permissive use, including loans and lettings for hire; (3) marriage; (4) service, a very large and most important class, including care-taking by depositories, warehousemen, etc., doing work on material, transportation, professional and domestic service, agency and partnership; (5) negative service, somewhat grudgingly recognized by law as interfering with freedom, and including contracts to withhold competition and other restraints of trade; (6) aleatory, which class includes bets and stakes, not enforced under modern legal systems; lotteries, tabooed in this and some other countries; wager contracts or stock jobbing — but it includes also annuities, bottomry, marine insurance and all other kinds of insurance. Accessory contracts are those — like (1) suretyship; (2) indemnity; (3) pledge; (4) warranty; (5) ratification — which create rights intended to be merely auxiliary to other rights. A contract of suretyship must be in writing according to the Statute of Frauds. Contracts are discharged: (1) By mutual agreement; (2) by performance; (3) by merger in, or substitution of, another agreement, also called novation; (4) by operation of law, i.e., prescription, statutes of limitation or because of the disability or legal incapacity (through infancy, lunacy, coverture, etc.) of one or more of the contracting parties. The right of action on a contract is assignable but the assignment must be in writing. Generally speaking, simple contracts as opposed to «specialties» may be entirely informal, and need not be written down, either in whole or in part. The English 'Statute of Frauds' passed «for the prevention of many fraudulent practices, which are commonly endeavored to be upheld by perjury and subornation of perjury,» renders void any contract for the sale of goods for the price of £10 and upwards, unless there be a part delivery of the goods, or part payment of the price, or some note or memorandum in writing of the bargain made and signed by the parties or their agents. The same statute, though it does not avoid the contract, allows no action to be brought on it until it has been written down and signed: When it makes an executor personally liable; or guarantees the debt of another; or creates a liability in consideration of marriage; or relates to an interest in land; or is not to be performed within a year. Another later English statute requires that the reacknowledgment of a debt that has been barred by the statutes of limitation must also be written and signed. The provisions of the 'Statute of Frauds' have been adopted with variations in most of the States of the Union. A written memorandum signed by the parties or their agents is generally required in the cases following:

(1) Contracts by their terms not to be performed within a year from the making thereof. (2) A promise to answer for the debt, default or miscarriage of another person. (3) Contracts made in consideration of marriage, except mutual promises to marry. (4) Promise of an executor, or administrator, to pay debts of deceased out of his own property. (5) Contracts for the creation of any interest or estate in land, with the exception of leases for a short term, generally one year. (6) Contracts for the sale of goods above a certain value, unless a portion of the price is paid or part of the goods delivered. The required value of the goods sold varies in different States from $30 to $200. In a number of the States no such provision exists. (7) In many of the States declarations or conveyances of trust estates. (8) In many States representations as to the character, credit or responsibility of another person.

Partial performance of the contract is generally held to dispense with the necessity for a writing.

Freedom of Contract.— The clauses of the State bills of rights, which prohibit the impairment or deprivation of life, liberty or property without due process of law, serve as a protection to the right to make contracts respecting personal services or property; with reference to the exercise of Federal power this right is protected by the Fifth Amendment to the Constitution; while, as regards action by the States, Amendment XIV provides that «no State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any State deprive any person of life, liberty or property, without due process of law.» There are some limitations to the right to make contracts. The laws which define the competency of persons to make contracts determine the validity of contracts so made; thus, infants, lunatics and married women (to a limited degree) are regarded as incapable of entering into a legal contract, and the obligations assumed under contracts made by such persons, even though made voluntarily, are void or revocable. Contracts opposed to public policy or violating valid legislative restrictions or prohibitions cannot be enforced, nor do the constitutional provisions extend protection to the obligations of such contracts. The valid exercise of the police power of the State may necessitate the imposition of certain restrictions on private rights, but such restrictions on the freedom of contracts do not impair the constitutional guaranties. Statutes may be passed in the public interest to regulate the sanitary conditions under which persons labor or to restrict the working hours of certain classes of laborers, such as women and children, and any contract made in violation of such prohibitions is invalid, since to this extent the State reserves the right to restrict the freedom of individuals to make contracts. By statutory provisions also the State may restrict the power of those in public employment to limit their obligations in this respect.

Impairment of Contracts.—Article I, section X, paragraph 1 of the Constitution provided that no State «shall pass any law impairing the obligation of contracts,» and most of the State constitutions contain a similar limitation. But there is a distinction between contractual obligations and those that are not contractual which may be determined by the ordinary legal rules defining the validity of contracts. The right to hold public office and the privilege of the elective franchise are not contractual obligations, and may be changed by subsequent legislation. Marriage and the inchoate rights of property existing in either party by virtue of marriage are subject to retrospective legislation. The constitutional prohibition applies not only to private contracts but to contracts made by a State or under its authority, wherefore no State by legislation may impair the obligations of its contracts. But the power to legislate on a subject may not be contracted away since one legislature may not bind a succeeding legislature with regard to matters coming within the scope of general legislative power, though in some cases a grant of certain rights or privileges may be deemed irrepealable. Thus, holders of bank notes issued under State authority or holders of State bonds which by statute have been declared receivable in payment of public taxes are protected by constitutional provision against infringement of their rights through subsequent legislation which aims to modify or repeal the statute conferring such rights. The further issue of such notes or bonds might be prohibited, but those who have acquired them while the statute was in force are possessed of so-called vested rights. Private individuals may not sue a State on its obligations. Charters granted to private corporations are contracts and, unless the right to alter, amend or repeal has been reserved to the State, the benefits accruing from such charters cannot be withdrawn or impaired by subsequent legislation (see DARTMOUTH COLLEGE CASE), though most States have constitutional or statutory provisions limiting the protection against subsequent legislation usually afforded to such charters by their status as contractual obligations. The charters of public corporations may not be considered as contracts, and, being in the nature of legislation, are subject to modification or repeal at the legislative will, if no individual interests have been vested under them. McClain says that, in general, subsequent remedial legislation changing the general law relating to procedure does not impair the obligation of contracts already made; but if a contracting party be deprived by statute of any substantial relief for breach of contract by the other party, then such statute constitutes an impairment of the obligations of the contract and to that extent is prohibited. Hence, while the period of limitation within which actions on contracts may be brought is subject to the legislative change, such change cannot be applied to existing contracts if the parties thereto be deprived of a reasonable time within which to bring action for enforcing their rights under their contracts.

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STEPHEN PFEIL.

CONTRACT LABOR. Previous to 1885, when on 26 February, the Contract Labor Law was passed by Congress, employers of large bodies of laborers were accustomed to arrange with their agents abroad for the shipment to this country of large numbers of an ignorant, servile class of foreign laborers—a practice that had a most disastrous effect upon home labor. These «assisted immigrants» reduced our labor market to a level with themselves, for not only was their passage-money paid, but they were bound by an agreement to work for a specified time at wages below those paid to resident laborers. A remedy for these evils was sought in the passage of the act above mentioned, which had a three-fold design, viz.: (1) to protect the interests of our own laboring classes; (2) to raise the standard of foreign immigrants; and (3) to check the immigration to this country of those who were unable to pay their own passage.

The main provisions of the Act are as follows:—

First. «The prepayment of transportation, or the assistance or encouragement of migration of aliens or foreigners under contract to labor in the United States, is unlawful.»

Second. «Such contracts made previous to their migration are void.»

Third. «Every person or corporation guilty of unlawfully assisting or encouraging the immigration of such laborers is subject to a penalty.»

Fourth. «The master of any vessel knowingly bringing such laborers into the country is to be decreed guilty of a misdemeanor.»

Various amendments have been added to the original act, providing for the proper inspection of vessels to ascertain violations of the law, if any; to prevent the landing of aliens that come within the prohibitions of the Act, or their deportation, if landed; forbidding the soliciting of immigration abroad by promises of employment in this country; and extending the penalties for violation of the Act so as to include any who may assist in bringing in prohibited aliens. On 3 March 1903, the prohibitions contained in the above act were extended to all forms of implied contracts, and made to cover labor or service of any kind, whether skilled or unskilled.

The Contract Labor Law and its supplementary legislation have been declared constitutional under the clause giving to Congress the power «to regulate commerce with foreign nations;» but the statute has been held by the United States Supreme Court to be directed only against the importation of unskilled cheap labor and to be applied solely to the «assisted immigrant brought into the country under contract to perform manual labor or service.» It is held, therefore, by amendatory legislation since 1885, that domestic servants, actors, artists, lecturers, singers, ministers, professors and members of a family or relatives of residents not of certain other excluded classes, as persons insane, diseased, convicts, or paupers, shall be exempt from the prohibitory provisions of the Act, and are entitled to admission.

The above laws have failed, however, fully to protect immigrants from southern Europe against the labor contractors known as padrones, who, taking advantage of the immigrants' ignorance of our language and customs, have gained control of laborers of their own race and often make large fortunes by furnishing these laborers to American employers. Consult United

States Immigration Commission, 'Immigration Legislation' (1912).

CONTRACT NOTES, the same as bought and sold notes (q.v.).

CONTRACT SURGEONS. By virtue of the act of 2 Feb. 1901, the Surgeon-General of the United States Army, with the approval of the Secretary of War, may appoint as many civilian physicians as may be necessary as contract surgeons, at a compensation not greater than $150 per month. Contracts may be general or special. Special contracts do not require travel or the giving up of private practice, and are for medical services at arsenals and similar places, where the amount of work does not justify the appointment of a medical officer. A general contract obligates the surgeon to take station and change station as ordered. He receives pay as stipulated in the contract and the allowances of a first lieutenant. Contract surgeons on general duty for more than three months must pass an examination like that for admission to the Medical Reserve Corps. Contract surgeons have a similar degree of authority over Hospital Corps men to that of medical officers and are accorded the same respect. The policy of the Army at present is against the appointment of contract surgeons on general duty, and reserve medical officers are now taking their place in increasing the military medical establishment. Formerly the Army employed dentists known as contract dental surgeons; these are now known as acting dental surgeons. See DENTAL CORPS.

CONTRACTILITY. See MUSCLES.

CONTRACTIONS, abbreviations employed with the view of saving labor in writing, and also in former times with the view of saving parchment in extending MS. copies of works and deeds. See ABBREVIATIONS.

CONTRAST. A term employed in psychology to denote an enhancement of a sensory experience which is induced by another sensory experience of the same modality. Contrast is alleged by some psychologists to occur also in feeling, and the term is occasionally loosely employed as a principle of explanation of certain spatial perceptions.

The contrast-effect may be successive or simultaneous. In successive contrast the inducing precedes the induced sensation in time. For example, an orange is more sour after dessert than before, the odor of Bordeaux is stronger following the scent of cheese, a surf of constant temperature seems warm on a cold day and cold on a warm day, a room of medium illumination seems light on emerging from a dark room, and dark on entering from the bright out-of-doors. In simultaneous contrast, on the other hand, the effect is induced simultaneously and it is reciprocal with the inducing sensation. If, for instance, a sub-liminal sweet is placed on one side and a supra-liminal salt on the other side of the tongue, then the sweet becomes liminal and the salt is enhanced. The best known instances of simultaneous contrast occur, however, in the field of vision. If from the same sheet of gray paper two narrow strips are cut and placed the one on a black, the other on a white background, then the former will appear much lighter and the latter much darker than the gray sheet (brightness-contrast). If, again, the same gray strips are placed the one on a well-saturated blue, the other on a good red background, and a sheet of tissue paper laid over all, then the former strip will be seen as yellow of poor chroma, the latter as a washed-out green (color-contrast). Vivid effects of color-contrast may also be seen in shadows, as, for example, the purple or violet shadows on the sun-lit snow. The results of the experimental investigation of color-contrast have been formulated in the following laws: (1) The contrast-effect is always in the direction of the complementary color; blue induces yellow, red induces blue-green, black induces white. (2) Color-contrast is greatest when brightness-contrast has been eliminated. (3) The nearer together the contrasting surfaces, the greater is the contrast-effect. (4) The elimination of contours enhances the contrast-effect. (5) The more saturated the inducing color, the greater is the contrast-effect.

Two types of theory have been offered in explanation of contrast, the one physiological, the other "psychological." Physiologically regarded, it may be said in general that successive contrast is the result of adaptation to the inducing stimulus; an orange is more sour after dessert because the taste bulbs having become adapted to sweet respond without compensation to sour. In smell, the odors which contrast are antagonistic so that adaptation to the one leaves the other as it were in bolder relief. In temperature, adaptation to an aerial cold seems to have correlated with it a "tuning" of the sense organs of warmth (in the area concerned) so that they respond to a stimulus of lower temperature; in the same way cold spots are "tuned" to a higher temperature of stimulus with adaptation to warmth. In vision, adaptation together with the negative after-image is sufficient to explain most cases of successive contrast. Adaptation fails, however, to explain cases of simultaneous contrast; the effect of adaptation always requires an interval of time, whereas simultaneous contrast is immediate. The case of the sub-liminal sweet noted above may ultimately be explained by the fact that the sensory nerves connected with the taste bulbs radiate to the two sides of the tongue; in the present state of our knowledge we can only guess that closely related areas of the cortex are thereby stimulated, and that attention to the sour facilitates the simultaneous arousal of the sweet. Simultaneous brightness and color-contrast has been most satisfactorily explained by Hering. This author supposes that the stimulation of a portion of the retina which involves an assimilation (or dissimilation) of a photo-chemical substance carries with it a simultaneous dissimilation (or assimilation) of the same substance in the contiguous unstimulated portion of the retina.

There are two "psychological" theories of importance. Helmholtz explained contrast as a deception of judgment. If, for instance, a gray strip on a green background appears reddish, it is because it is seen as if through a green haze and the mind unconsciously infers that if the strip is gray it must appear reddish in order to compensate for the green. Except for an occasional text-book of physiology this theory has long since been given up; experiments may be devised which preclude the possibility of inference, and, furthermore, no explanation in terms of the unconscious is satisfactory to science. Wundt, in his early books, brought contrast phenomena under his theory of relativity. (See WEBER'S LAW). He supposes that the effect results from the fact that we apperceive all sensory and affective experiences in relation to each other. As against this theory James has pointed out that the contrast-effect is directly experienced, and it cannot by any logic be made to depend upon an act of apperception. Wundt, however, now recognizes the physiological condition of contrast as a secondary principle of explanation.

The occurrence of contrast phenomena in feeling is doubtful. The opposition of affective qualities is not, as some authors assume, like that of color qualities. Pleasantness and unpleasantness are opposites in the sense that they are mutually exclusive. A decrease of the one, therefore, does not mean an increase of the other, i.e., the change is in the direction of indifference, of no feeling at all. It is true that pleasantness and unpleasantness are logically opposed, but there is no experimental evidence of an enhancement of the one by the previous experience of the other.

In space perception the size of objects and length of lines often seem larger or smaller, longer or shorter by virtue of the presence of objects or lines whose size or length is logically opposed. The illusion is not due to a contrast-effect as is often alleged, but to some brain-habit or disposition which conditions the perception.

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HARRY P. WELD,
Assistant Professor of Psychology, Cornell University.

CONTRAT SOCIAL, kôn'trä' sō'sē-äl', a work by Jean Jacques Rousseau (q.v.), embodying his political ideas and defending the sovereignty of the people. It was published in 1762 and was one of the powerful influences affecting the leaders of the Revolution.

CONTRAVENTION, in French law, an act done in violation of a legal obligation or condition. It is most frequently applied in Scottish law to any act done by an heir of entail in opposition to the deed of entail, or to the action founded on a breach of law-burrows.

CONTRAYERVA, kōn-trą-yėr'vą (Span. *contrayerba*, counter herb), the aromatic bitterish rootstock of *Dorstenia contrayerva*, a plant imported from tropical America, and used as a stimulant and tonic. The drug was once in much repute in low fevers, and was considered efficacious against snake-bites whence the name. See DORSTENIA.

CONTRERAS, kōn-trā'rās, **Hernando de**, Spanish adventurer: b. Spain about 1520; d. Panama May 1550. He was the son of Rodrigo de Contreras (q.v.), governor of Nicaragua. After the fall of his father, and the confiscation of his property, Hernando and his brother, Pedro, with a number of dissatisfied officers, arranged a plot to seize Peru and Panama, which the brothers claimed as inheritors of the estate of their grandfather, Pedrarias. Hernando was to be king of the new realm, but was never proclaimed, as the failure of his attempt within two months made such a course impossible. Panama was captured 20 April 1550, after several Church dignitaries had been slain, and a large part of the royal treasure stored in the city was taken. Hernando took a considerable part of his force to pursue one of the royal officers, leaving Pedro in command at Panama. The citizens improved the opportunity to retake the city, and Hernando was drowned shortly afterward. The other brother was never again heard of.

CONTRERAS, Juan Senen de, Spanish general: b. Madrid 1760; d. there 1826. He entered the Spanish army in youth, in 1778 took an active part in the Austrian campaign against the Turks, and in 1795 commanded in the War of Independence. While captain-general he gallantly but unsuccessfully defended Tarragona and was captured by the French. He was imprisoned in the castle of Bouillon on the Belgian frontier, but escaped in 1812, and two years later returned to Spain. His narrative of the siege of Tarragona formed the third volume of 'Mémoires relatifs aux révolutions de France et d'Espagne' (1825).

CONTRERAS, Rodrigo de, Spanish cavalier: b. Segovia, Spain, about 1495; d. Peru sometime after 1557; the last date when he was known to be living. He was appointed governor of Nicaragua in 1531, and sent an expedition into the interior, which discovered and explored Lake Nicaragua. The expedition had trouble with the adventurer, Robles, who tried to seize the newly discovered country, but was defeated. The administration of Contreras was turbulent and marked by constant disputes with the royal authorities and the dignitaries of the Church. Finally he was formally charged with various crimes and misdemeanors, found guilty, driven from the country, and all his property confiscated (1549). He vainly sought redress from the Spanish government, and finally returned to America, going to Peru, where he was not heard of after 1557. For the attempt of his sons to avenge their father's alleged wrongs, see CONTRERAS, HERNANDO DE.

CONTRERAS, Mexico, village about 12 miles southwest of the city of Mexico, the scene, 19–20 Aug. 1847, during the Mexican War, of an important battle between a Mexican force of 7,000 under General Valencia, supported by another of 12,000 under General Santa Anna, and a United States force of 4,500 under General Scott. The Mexicans occupied a strong position on high ground and fought for a time with great gallantry, but, being attacked both in front and rear at daylight on the 20th, finally gave way and fled in confusion, after having lost in killed and captured over 1,500.

CONTRERAS, Battle of (Mexican name, *Padierna*), in the Mexican War, 20 Aug. 1847. At Churubusco (q.v.), the main road south from the city of Mexico is joined from the southwest by another, running to the hills beyond the hamlet of Contreras. This is about 12 miles from the city; a mile nearer the latter is the hamlet of Padierna. The road to Mexico City winds around the east flank of the ridge, across the brook from Padierna and keeps on north, across four brooks to the important village of San Angel. The Mexican general, Valencia, with the «Veterans of the North,» forming the right of Santa Anna's army, had made his headquarters at San Angel on the 17th; and he decided to occupy and fortify Pelón Cuauhtitlan, two miles southwest, to block the road to the capital skirting it. Powerful batteries were placed to command this and sweep the pedregal; and some 7,000 men were concentrated about the ridge, and facing Auzaldo and San Geronimo. Santa Anna, apprehensive for his position on the main road, ordered Valencia to retire to Churubusco; but Valencia refused. On the 19th, Scott, at San Augustin, ordered a road leveled to Padierna; Twiggs and Pillow to check the enemy meanwhile. A fierce running fight with the Mexican troops ensued, and skirmishing continued. At 2.30 A.M. of the 20th, a dismal morning of cold, rain and fog, Smith and Riley moved southwest through the steep, gullied, slippery streets of San Geronimo, and, unperceived, gained positions southwest of the ridge on the right flank of Valencia's lines. Meantime a strong diversion was made by an assault on Padierna and along the rocks. The battle was won by a single impetuous onslaught of Riley's troops against Valencia's main batteries on the ridge, when the «Veterans of the North» broke and scattered like sheep. The battle was over in 17 minutes, and the Mexican army a routed mob, in face of a force numbering but a fraction of their own. Shields, who had taken Smith's place at San Geronimo, marched rapidly to Auzaldo to cut off the retreat; but a portion of the army escaped in wild flight toward Churubusco along the San Angel road, while the rest plunged in disorder down the steep flanks of San Geronimo, leaving all impediments behind. No more brilliant victory was won in the war. Scott had not over 4,500 men in sight, to Valencia's 7,000, and Santa Anna's 12,000 within supporting distance; and the natural and artificial defenses should have made the Mexican positions impregnable. The latter lost 700 killed and wounded, and 813 prisoners, including 88 officers, four of them generals; 22 brass cannon, vast quantities of small arms and ammunition, and many hundreds of pack-mules and horses. The American loss was 60 killed and wounded. This route contributed materially to the winning of Churubusco. Consult Wilcox, ‘History of the Mexican War’; Wright, ‘Life of Scott’; Scott, ‘Autobiography.’

CONTRIBUTION, in law, the right of one person to exact from another his pro rata share of a common loss, as where one of two sureties discharges the entire obligation, he is entitled to secure from his cosurety his share of the amount, (See Indemnity; Principal and Agent). In the law of war, contribution denotes the levy of money or supplies imposed by an invader upon the citizens of the territory occupied. See Conquest, Right of; Taxation; Tribute; War, and consult the authorities referred to under the last named.

CONTUMACY, kŏn'tū-mą-sĭ, the offense of refusal or neglect of a party accused to appear or answer to a charge preferred against him in a court of justice, chiefly known in countries on the European continent. *Actual* contumacy is the refusal of a party actually before the court to obey some order of the court. *Presumed* contumacy is the act of refusing or declining to appear upon being cited. In civil causes a person in such case may be properly made liable to a decision against him for his neglect in not appearing to defend his rights; but by an extension of the principle to criminal cases persons are often sentenced, in their absence, to punishment *in contumaciam*, i.e., they are regarded as charged with the offense, but not convicted thereof.

CONTUSIONS, lesions of the body resulting from a blow struck by a blunt instrument without breaking of the skin or fracture of a bone. Contusions may involve the skin alone, or may produce some change in the deeper tissues. In contusions there is, as a rule, some rupture of blood vessels. This results in the extravasation of blood, which, if small in amount, causes minute spots called petechiæ. When elongated in stripes such hæmorrhages are called vibices; or, when irregular and small, ecchymoses. When the hæmorrhage is large and collected in one place, they are termed hæmatonata. Contusions, if very severe, may result in gangrene, hence all large contusions need prompt medical attendance, but small contusions may be treated with hot water in which there is some antiseptic, as a one-per-cent solution of carbolic acid; and if carefully bandaged and kept from being infected, they usually recover quickly.

CONUS, a genus of gasteropodous mollusks, the type of the famly *Conidæ* or cone-shells, so named from the form of the shell. They are found in the southern and tropical seas. The genus comprises several hundred species, some of them having very beautifully colored shells which are much prized by collectors. The rarest and finest of these is *C. gloria-maris.* All have a short, strong foot bearing a water-pore, two tentacles with eyes set on the outside at the centre and a long siphon. They live in holes in rocks and in the clefts of coral-reefs, and their food consists mainly of other mollusks. Some of the species have a poisonous bite.

CONVALLARIA, the lily-of-the-valley, the typical genus of the tribe *Convallariinæ* of the *Liliaceæ*, or lily family. The order has about 23 genera, and 215 species, widely distributed. Nine of the genera are found in the American flora, among them: *Asparagus, Clintonia, Polygonatum convallaria* and *Trillium.* See Lily-of-the-Valley.

CONVECTION OF HEAT. See Heat.

CONVENT (Lat. *conventus*), primarily the community of monks or nuns occupying a monastery, priory or other establishment of a monastic or semi-monastic character. But the word is generally used to designate rather the establishment itself, if it is simply a cloister and not a considerable monastery or an abbey. The parts of a properly equipped conventual establishment are the church or chapel, including the choir, namely, that portion of the church in which the members assemble to recite or chant the psalms, etc., of the canonical hours; the chapter-house, an apartment in which the inmates assemble to deliberate or discuss community affairs; the cells, or separate quarters of the inmates; the refectory or dining-hall; the dormitory; the infirmary; the parlor for reception of visitors; the library; the treasury; the cloister, an enclosed space for recreation; and the crypt, the convent's place of burial. The word «cloister» is also used in the sense of convent: in that use cloister signifies a religious house access to which is restricted by the laws of the Church. In its popular sense the word is applied to an establishment containing a sodality of nuns, the male religious being denominated monks and their establishments monasteries. Convents are generally classed as strictly enclosed and unenclosed, but these divisions often overlap in function and are not mutually exclusive. The former represent the older type of convents to which women were attracted by a desire to save their own souls and those of others by prayer, seclusion and mortification, while the latter refers to those which are devoted to active work along educational or social lines for the relief of others. Routine is prescribed; the bishop of the diocese has the inspection of the convent under his charge. In most orders the nuns are divided into choir sisters, who have religious duties only, and lay sisters who perform the manual labor of the convent. The first convent in England was erected at Folkestone in 630. The history of European convents follows the history of the monasteries. Consult Hélyot, ‹Histoire des ordres religieux› (Paris 1792); Eckenstein, ‹Woman under Monasticism› (Cambridge 1896); Steele, ‹The Convents of Great Britain› (London 1902).

CONVENTICLE, a private assembly or meeting for the exercise of religion. The name was at first given to the private religious meetings of the early Church and then to a cabal of monks for the purpose of securing the election of a favorite as abbot. It was next applied as a term of reproach to the religious assemblies of Wickliffe, the meetings of the English and Scottish nonconformists, and afterward applied to meetings of petty sects and dissenters generally. In strict propriety the word denotes an unlawful assembly, and cannot therefore be justly applied to the legal assembling of persons in places of worship licensed according to law. The Conventicle Act of 1664 outlawed all assemblies for religious purposes other than those of the Church of England. The penalty for repeated offenses was transportation.

CONVENTION, Political, an assemblage of delegates representing the members of a political party, whose leading function is to nominate the candidates of that party for elective offices. In the early years of the nation candidates were often nominated at mass meetings, but the growth of the country necessitated a change. Delegates were appointed by the local caucuses to confer with delegates from other caucuses in the city, county or district, with the object of making nominations for the next larger area. This method quickly gained favor and early in the 19th century Pennsylvania adopted the county convention and Massachusetts and other States both the county and Congressional conventions. The legislative caucus performed the functions of the State convention for many years because of the difficulties of travel and communication over so large an area; the legislative caucus method also was used in the nomination of national candidates, and, as the Congressional caucus, was used for more than 25 years to choose the party candidates for President and Vice-President. During the campaigns of 1824 and 1828, owing to the failure of the Congressional nominating caucus, the factions of the Democratic-Republican party held nominating conventions that were neither national nor systematically representative, and the first nominating convention that can be called national was held at Baltimore in 1831 by the Anti-Masonic party. Since that time the system has gradually developed into the present complicated but well-ordered system.

Minor Conventions.— First in order of the nominating conventions is the local primary, caucus or primary convention, called together by the primary committee, and consisting of those voters affiliated with the party who reside in ward, precinct or township. This primary makes nominations to local offices and selects delegates to the nominating convention of the county or district. The county convention nominates candidates to county offices and sends delegates from among its members to a district convention which selects candidates for Congress and elects delegates to the State convention. In some States delegates to both district and State conventions are elected by the town primaries. The State convention nominates candidates for State offices and sends delegates-at-large to the national convention. In the Democratic party the State convention may select all the delegates and instruct them. The State convention formulates party policy within the State and decides questions of party regularity, though appeal may be made to the national convention. The basis of representation in the State convention is the party vote at the preceding election — whether Presidential or gubernatorial, whereas the membership of the national convention is not concerned with party strength.

Party Committees.— In early times the convention concerned itself only with the immediately succeeding campaign; it had a chairman, secretary, treasurer and other necessary officers, but the organization was purely temporary and had no permanency; on adjournment the organization lost its existence, and the next convention might be called either by the officers of the previous convention or by an informal self-appointed committee. Hence conventions adopted the plan of appointing permanent committees to act in their behalf during the interval between conventions. The Democratic convention of 1848 was the first to appoint a national committee but the committee's value was not generally recognized until after the Civil War. The national committee is now composed of one member from each State and Territory (chosen for four years or until the next national convention) and though subordinate to the convention exercises great authority — often possessing sufficient power and influence to control the convention and dominate its policies. It decides the place of meeting, arranges the seating of delegates, and, most important of all, selects the temporary chairman of the convention, who sounds the keynote of the campaign. It has then performed its duties and on the opening of the convention is dissolved to make way for the appointment of a new committee, the members of which are in harmony with the Presidential candidate. The chairman of the national committee, chosen by the President, who is the nominal head of his party, is both nominally and actually the head of the organization and is in close touch with the candidates. When the convention closes the new national committee organizes at once and is usually divided into subcommittees, such as the executive committee, the finance committee, the committee on bureau of speakers, the committee on publicity to supervise the literature, press matter and distribution of public documents. Though not organically connected with State and local committees, the national committee in effect, through its State member, directs the campaign in every minor division. There is also the national Congressional committee, the organization of which differs in the two largest parties. The Republican committee consists of one member from each State and Territory represented in Congress (provided that State has a representative in Congress) chosen in a joint caucus of the members of both Houses. The Democratic committee is chosen at separate caucuses of the two Houses, nine members being appointed by the Senate and one member being appointed for each State and Territory represented in Congress. If a State has no Democratic representative in Congress, a prominent Democrat of that commonwealth is appointed to the committee. The Congressional committees have charge of the mid-term elections when the two parties endeavor to elect a majority in Congress either as an endorsement or a condemnation of the party which has previously elected the President. Subordinate to the national committees are the State central or State executive committees, varying in their machinery according to the section of the country. Outside of New England, where the town committee holds the most important place, the county committee is almost universally the important one, but no district is too small to be used as a basis for party work, the Congressional, senatorial, judicial and school districts, and the city wards or precincts all having their share in the party organization. The State executive committee (comprising as few as 13 members, as in Indiana, or more than 100 members, as in Pennsylvania) may be named by the chief candidates of the party or may consist of representatives of Congressional or State senatorial districts and of counties.

The National Convention.— Both national conventions are composed of two delegates from each Congressional district and four delegates-at-large from each State. Thus a national convention contains twice as many delegates as there are members of the House and Senate combined. Both the largest parties admit delegates from the Territories, varying as to numbers and privileges of voting. The State organization determines the method of electing delegates to national conventions but the Republicans prescribe that delegates shall be chosen in the same way that Congressmen from the same districts are nominated — either at primary elections or district conventions. The Democratic delegates may be selected by the State convention as a whole, by the delegates of each individual district or by each district at a district convention. Having assembled, the convention at its first session accepts the temporary officers nominated by the national committee and upon the roll call by the temporary chairman, the delegates of each State and Territory select one of their number as a member of each of the four most important convention committees, by whom the permanent organization of the convention is effected. At the next session, on the acceptance of the report of the committee on credentials, the permanent chairman, vice-presidents and other officials are elected and the rules adopted, usually as suggested by the committee on rules and order of business. Democratic national conventions have always required a two-thirds vote for the nomination of President or Vice-President, but the other parties require only a simple majority. The Democrats also employ the «unit rule,» under which a majority of the delegates from a State may cast the entire vote of the State even over the protest of the minority, whereas the Republicans allow delegates to vote as individuals even though the State convention may have instructed the delegation to vote as a unit. The rules having been adopted, the committee on resolutions then presents the platform which may or may not be amended by the convention before acceptance. The nomination of candidates is the next and most important business, the roll being called by States in alphabetical order, whereupon the delegates selected to place the candidates in nomination make their formal speeches. The balloting continues until one candidate receives the vote required to nominate, several days being consumed sometimes in reaching an agreement. Having completed the most important task for which they assembled, the delegates finish the work of the convention by electing a new national committee which, as previously stated, takes full charge of the campaign and remains in office until the next national convention has assembled. The direct primary (q.v.) has done much to rid the political parties of the obnoxious «boss» system by making the nominations more truly representative of the body of the voters. It has shown also that the convention system is not a necessity but is mainly useful for the formulation and promulgation of party principles.

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CONVENTION OF 1787. See CONSTITUTION, FRAMING OF THE.

CONVENTIONS, Constitutional, in the United States. Conventions for the purpose of framing constitutions originated in the United States during the early years of the Revolution (1774–76) and the development of the methods employed may be divided into three phases: first, the framing of constitutions by the regular legislative bodies under direct authorization of the people; second, the performance of that function by a body separate and distinct from the regular legislature; and third, the submission of the proposed constitutions to popular approval before they become effective. The colonial legislative assemblies actively participated in the movement leading up to the Revolution; but as the royal governors (save in Rhode Island, Connecticut, Delaware and Pennsylvania) could adjourn, prorogue or dissolve these bodies, their replacement became necessary when the period of military opposition arrived. Hence provincial congresses or conventions sprang into existence during 1774–75, but as these were only temporary organizations, Continental Congress recommended to New Hampshire (3 Nov. 1775) and to South Carolina (10 May 1776) that the people select representatives, who, if they deemed necessary, should establish a form of government to continue during the dispute with the mother country. Under this recommendation a number of constitutions were framed during 1776 to 1778. In eight instances (North and South Carolina, Georgia, Virginia, New Jersey and the continuation of the charters in Massachusetts, Rhode Island and Connecticut) the constitutions were adopted and promulgated by the legislative bodies without previous authority from or ratification by the people. In New Hampshire and Delaware in 1776, and in Georgia, New York and Vermont in 1777, the legislative bodies had been expressly authorized by popular vote to take such action, but the instruments enacted were not in any way submitted to the people. In Maryland, Pennsylvania and North Carolina in 1776, and in South Carolina in 1778, the legislatures which framed the constitutions received express authority from the people, and some time before enactment, copies were distributed so that the people might have an opportunity to object and suggest changes.

The principle that popular authority should be given before a constitution could be framed seems to have been well established and the feeling prevailed too that no constitution should be adopted until submitted to and approved by the people. Some of the first constitutions were informally submitted (Pennsylvania, Maryland, North and South Carolina), but the first instrument of government formally subjected to a referendum was the proposed Massachusetts constitution of 1778. The first constitutions framed by bodies separate and distinct from the regular legislatures — and the only ones so framed during the Revolutionary period — were those of New Hampshire and Massachusetts. In the former colony delegates were selected in 1778 and drafted a constitution in 1779, but on submission to the people it was rejected, as were two constitutions proposed by the second convention in 1781 and 1782, but the third constitution submitted by the second convention in 1783 was adopted. In 1777 a majority of the Massachusetts towns authorized the formation of a constitution by the general court, but the proposed instrument was rejected in 1778, largely because it had not been framed by a body appointed for that special purpose. Accordingly, a distinct convention was assembled and the constitution drafted by it was accepted in 1780.

Since 1784, with a few exceptions, constitutions have been framed or adopted by conventions chosen by the people for this special purpose. The Nebraska constitution of 1866, however, was framed by the territorial legislature and submitted to the people by that body. In Michigan the legislature provided for a special commission to prepare a new constitution but in 1874, when the instrument as drafted was submitted to popular vote, it was rejected. In Rhode Island a constitution was prepared in a similar manner but it was rejected in 1898 and 1899. In 1911 the Indiana legislature drafted a new constitution but the courts enjoined the legislature from submitting it to the people. Though more than 200 conventions have been held not all have framed constitutions; the Massachusetts constitution of 1780 remained practically unchanged until the revision of 1917–18, though conventions were held in 1820–21 and 1853. Some States hold constitutional conventions more frequently than others; Virginia has held conventions in 1776, 1829–30, 1850–51, 1861, 1864, 1867–68 and 1901–02; and in 1776–77, 1801, 1821, 1846, 1867–68, 1894 and 1915 similar bodies met in New York; but in Minnesota no convention has assembled since the constitution was framed in 1857, and only two have been held in Indiana (1816 and 1850–51). The number of conventions in the Southern States is relatively larger owing to the secession conventions and the two sets of conventions called in these States during the Reconstruction period. For the history and characteristics of the State constitutions see UNITED STATES — THE FORMATION OF STATE CONSTITUTIONS; UNITED STATES — STATE CONSTITUTIONS OF THE; CONSTITUTION, FRAMING OF THE; CONSTITUTION OF THE UNITED STATES; CONSTITUTIONAL AMENDMENTS, HISTORY OF; UNITED STATES — THE FEDERAL CONVENTION OF 1787.

Constitutional conventions have been held in the various States in the following years, most of the instruments framed being adopted the same or the succeeding year, but in some cases constitutions were framed by bodies other than regularly constituted conventions (the words "not submitted" meaning that the constitution was put into operation without first submitting it to popular vote):

ALABAMA: 1819; 1861 (not submitted; secession convention); 1865 (not submitted; Reconstruction convention); 1867; 1875; 1901.
ARIZONA: 1910.
ARKANSAS: 1836 (not submitted); 1861 (not submitted; secession convention); 1864 (not submitted; Reconstruction convention); 1864; 1868; 1874.
CALIFORNIA: 1849; 1878–79.
COLORADO: 1864 (rejected); 1865 (ratified but State not admitted); 1875–76.
CONNECTICUT: Operated under colonial charter of 1662 until many years after Revolution; 1818.
DELAWARE: 1776 (not submitted); 1792 (not submitted); 1831 (not submitted); 1852–53 (rejected); 1897.
FLORIDA: 1838–39 (not submitted); 1861 (not submitted; secession convention); 1865 (not submitted; Reconstruction convention); 1868; 1885.

Georgia: 1776 (temporary constitution proclaimed by Provincial Congress); 1776–77 (not submitted); 1788; 1789 (not submitted); 1795 (amendments, not submitted); 1798 (not submitted); 1833 (amendments, rejected); 1838; 1839 (amendments, rejected); 1861 (not submitted; secession convention); 1865 (not submitted; Reconstruction convention); 1867–68; 1877.
Idaho: 1889.
Illinois: 1818 (not submitted); 1847; 1862 (rejected); 1869–70.
Indiana: 1816 (not submitted); 1850–51 (revised in 1911 by legislature but injunction issued against its submission to people).
Iowa: 1844 (rejected); 1846; 1857 (Amendments of 1900 were held to be unconstitutionally proposed and adopted).
Kansas: 1855 (Topeka Convention); 1857 (Lecompton Convention); 1858 (Mineola-Leavenworth Convention); 1859 (Wyandotte Convention; constitution ratified 1859, effective 1861).
Kentucky: 1792 (not submitted); 1799 (not submitted); 1849–50 (not submitted); 1890 (constitution was changed by convention after its approval by people).
Louisiana: 1811–12; 1844–45; 1852; 1861 (not submitted; secession convention); 1864 (Reconstruction convention; government organized under this constitution not recognized by Congress); 1867–68; 1879; 1898; 1913.
Maine: 1819.
Maryland: 1776 (not submitted); 1850–51; 1864; 1867.
Massachusetts: 1777–78 (rejected, wherefore the State lived under its colonial charter until 1780); 1779–80; 1820–21 (amendments); 1853 (rejected); 1917–18.
Michigan: 1835; 1850; 1867 (rejected); 1873 (revision by a commission rejected in 1874); 1907–08.
Minnesota: 1857.
Mississippi: 1817; 1832; 1861 (not submitted; secession convention); 1865 (not submitted; Reconstruction convention); 1868 (rejected in 1868 but adopted in 1869); 1890 (not submitted).
Missouri: 1820; 1845–46 (rejected); 1861–63 (not submitted, Union Convention); 1865; 1875.
Montana: 1889.
Nebraska: 1866 (drafted by committee and adopted by voters but not accepted by Congress until 1867); 1875.
Nevada: 1863 (rejected); 1864.
New Hampshire: 1775–76 (not submitted); 1778–79 (rejected); 1781; 1782 (rejected); 1783; 1791–92; 1850 (amendments rejected); 1851; 1876; 1889; 1902; 1912.
New Jersey: 1776 (not submitted; Revolutionary Congress); 1844; constitutional commissions sat in 1873 and 1894.
New Mexico: 1889–90 (rejected); 1910.
New York: 1776–77 (not submitted); 1801 (five amendments promulgated without submission); 1821; 1846; 1867–68 (rejected); 1894; 1915 (rejected).
North Carolina: 1776 (not submitted); 1835 (amendments); 1861 (not submitted; secession convention); 1865 (not submitted; Reconstruction convention); 1866 (convention reassembled, proposed amendments rejected); 1868; 1875.
North Dakota: 1889.
Ohio: 1802 (not submitted); 1850–51; 1873–74 (rejected); 1912 (34 out of 42 propositions adopted).
Oklahoma: 1905 (convention proposes new State to be called Sequoyah); 1907.
Oregon: 1857.
Pennsylvania: 1776 (not submitted; Revolutionary Congress); 1783–84 (council of censors met without action); 1789–90 (proclaimed without submission); 1837–38; 1872–73.
Rhode Island: Operated under colonial charter of 1663 until 1842; 1824 (rejected); 1834 (abortive); 1841–42 (People's Convention); 1841–42 (charter government convention); 1842.
South Carolina: 1776 (not submitted; promulgated by Revolutionary convention); 1777–78 (put into effect by legislature without submission); 1790 (not submitted); 1860–61 (not submitted; secession convention); 1865 (not submitted; Reconstruction convention); 1868; 1895.
South Dakota: 1889.
Tennessee: In 1772 the Watauga Association adopted a constitution and in 1784 a constitution was put into operation in the State of Franklin but was not ratified at convention of 1785; 1796 (not submitted); 1834; 1861 (secession convention); 1865 (Reconstruction convention); 1870.
Texas: In 1827 a constitution was framed for Coahuila and Texas; in 1833 another was framed at San Felipe but never recognized by Mexico or put into operation; in 1835 a "Provisional Constitution" was framed; and in 1836 the constitution of the Republic of Texas; 1845; 1861 (secession convention); 1866 (Reconstruction convention); 1868; 1875.
Utah: 1895.
Vermont: 1777 (not submitted); 1786; 1793; 1799; 1806 and 1813 (meetings of council of censors, abortive); 1822 and 1828 (amendments referred to conventions by council of censors and all but one rejected); 1836; 1843; 1850; 1857; 1870; 1880 (amendments proposed by Senate, council of censors having been abolished and adopted by people in 1883); 1890, 1900, 1910 and 1913 (amendments submitted but only 10 adopted at elections).
Virginia: 1776 (not submitted; Revolutionary convention meeting as a constitutional convention); 1829–30; 1850–51; 1861 (secession convention); 1861 (not submitted); 1864 (not submitted; Reconstruction convention); 1867–68; 1901–02.
Washington: 1889.
West Virginia: 1861–62; 1872.
Wisconsin: 1846 (rejected); 1847–48.
Wyoming: 1889.

Methods of Calling Conventions.— The only provisions for calling conventions to be found in the earlier State constitutions were contained in those of Pennsylvania (1776), Vermont (1777), Georgia (1777), Massachusetts (1778) and New Hampshire (1784). In Pennsylvania the people were to elect a council of censors every seventh year, on the consent of two-thirds of whom a convention might be called to amend such parts of the constitution as the council thought necessary, but any proposed amendments, additions or excisions should be promulgated "at least six months before the day appointed for the election of such convention, for the previous consideration of the people, that they may have an opportunity of instructing their delegates on the subject." Only one meeting of this council was held and in 1790, after the constitutional requirements had been ignored in calling the convention of 1789, the council was abolished. Vermont made the same provision but the members of the council of censors were to be elected in a different manner. The Vermont council had called several constitutional conventions before being abolished in 1870. The Georgia constitution of 1777 provided that the legislature should call a convention if petitioned to do so by a majority of the voters of a majority of the counties, but the petitions must specify the desired amendments and in calling the convention the legislature must do likewise. In Massachusetts the desirability of revising the constitution was to be voted upon in 1795 and if two-thirds of the votes cast favored such revision, the general court was to call a constitutional convention, but as the vote was adverse the State never afterward had a constitutional provision for calling conventions, though the State attorney-general contends that such a convention is not only legal but is expressly authorized by the State constitution (1917 Mass. House Doc. 1711, pp. 2–3). The New Hampshire constitution of 1784 provided for the calling of a convention within seven years upon a favorable popular vote and the constitution of 1792 contained a similar provision for a vote within each seven years thereafter. Seven of the Revolutionary constitutions which continued after 1784 made no provision for conventions and others recently adopted have omitted such provisions (Georgia, 1798; Connecticut, 1818; New York, 1822; Missouri, 1820; Rhode Island, 1842; Pennsylvania, 1790, 1838, 1873; Virginia, 1830, 1852, 1864; Vermont, 1870; Arkansas, 1868, 1874; Tennessee, 1834; Texas, 1868; Louisiana, 1845, 1851, 1864, 1868, 1879, 1898), though in States which possess no such constitutional authority it has been assumed that conventions may be called.

Of the State constitutions now in force, 12 (Massachusetts, Vermont, Connecticut, Rhode Island, New Jersey, Pennsylvania, Mississippi, Louisiana, Texas, Arkansas, Indiana, North

Dakota) make no provision whatever for calling conventions, but conventions may be called in these States by legislative action, and the legislature has power to determine whether the people shall have an opportunity to express their wishes by voting upon the subject. Judge Jameson calls attention to 27 conventions which have met without constitutional authority for their assembling (Arkansas, 1874; Connecticut, 1818; Georgia, 1833, 1839; Indiana, 1850; Louisiana, 1852, 1879; Massachusetts, 1853; Missouri, 1845, 1861, 1865; New Jersey, 1844; New York, 1801, 1821, 1846; North Carolina, 1835; Pennsylvania, 1837, 1872; Rhode Island, 1824, 1834, 1841, 1842; South Carolina, 1790; Tennessee, 1870; Texas, 1876; Virginia, 1829, 1850) and since he wrote there have been at least three cases of the same character — Mississippi in 1890, Louisiana in 1898 and Connecticut in 1902. To this list also should probably be added the conventions of Delaware, 1791 and 1852; Maryland, 1850; Massachusetts, 1820 and 1917–18; and Indiana, 1918. Under another class of constitutions, such as those of Maine and Georgia, the legislature is empowered to call conventions without first submitting to popular vote the question whether a convention shall be held. Among the conventions thus called were those of Connecticut (1818), Rhode Island (1824, 1834, 1841, 1842), New Jersey (1844), Missouri (1861, 1865), Arkansas (1874), North Carolina (1875), Louisiana (1879), Mississippi (1890) and the secession and reconstruction conventions. On the other hand, several legislatures, though bound by no constitutional provisions, submitted the question to the people; among such were the conventions of Massachusetts (1820, 1853), New York (1821, 1846), Virginia (1829, 1850), Maryland (1850), North Carolina (1835), Pennsylvania (1837, 1872), Missouri (1845), Louisiana (1852, 1898), Tennessee (1870), Texas (1875) and Connecticut (1902). A third plan, adopted by 32 States, requires popular approval before a convention can be called, but in 25 of these States (Alabama, California, Colorado, Delaware, Florida, Idaho, Illinois, Kansas, Kentucky, Minnesota, Missouri, Montana, Nebraska, Nevada, North Carolina, Oregon, South Carolina, South Dakota, Tennessee, Utah, Virginia, Washington, West Virginia, Wisconsin and Wyoming) the legislatures have the power to decide the proper time when the question of holding a convention shall be submitted to the people. Seven constitutions contain a provision that the question of calling a convention shall be voted upon by the people at regular intervals without reference to legislative action. New Hampshire requires a vote upon this question every 7 years; Iowa every 10 years; Michigan every 16 years; Maryland, New York and Ohio every 20 years; and Oklahoma at least once every 20 years, though the legislature has discretionary power to submit the question more frequently. The legislatures of Iowa, Michigan, New York and Ohio may submit to the people the question of holding a convention at other times than those above specified. In States where the initiative and referendum are in vogue the legislatures have lost a large part of their control over the calling of conventions, since the people themselves may initiate and adopt a measure providing for the holding of a convention. These provisions have been adopted in the following States: Oregon (1902), Oklahoma (1907), Missouri and Michigan (1908), Arkansas and Colorado (1910), Arizona and California (1911), Nevada, Nebraska and Ohio (1912) and North Dakota (1914), and in 1913 Michigan broadened and simplified the provision inserted by the convention of 1908. In Idaho, Maine, Montana, South Dakota, Utah and Washington also the people can initiate and adopt a measure providing for the holding of a convention and by referendum may veto any statute by which the legislature attempts to interfere with a convention.

In most cases legislative action is necessary after the people have voted in favor of a convention, since delegates must be elected and provision be made for the assembling of the convention, though in only eight States are such matters left entirely in the hands of the legislature; some of the constitutions expressly limit the number of delegates and regulate their appointment, method of election, etc. In Michigan, New York and Missouri, however, the convention assembles as a matter of course without legislative action, the constitutions themselves containing provisions respecting appointment and election of delegates and the assembling of the conventions. When Congress passes an act enabling a Territory to apply for admission as a State, such act contains a provision for the number and election of delegates to a convention for the purpose of framing the new State constitution. But if the Territorial legislature itself take the initiative in calling such a convention, with the ultimate object of applying for admission into the Union, provision for delegates, etc., is usually made by the Territorial legislative act. Respecting a national convention, Article V of the Constitution of the United States provides that "the Congress . . . on the application of the legislatures of two thirds of the several States, shall call a convention for proposing amendments," thus imposing on that body no restrictions as to the conditions under which the convention shall be held.

Procedure of Constitutional Conventions. — Conventions act under very few constitutional restrictions as regards their procedure, and in general have adopted their own rules, differing but slightly from those of other deliberative bodies. Though possible, few conventions attempt to perform their functions as a body, but usually divide the work among committees. The method of transacting business mainly in committee of the whole, with a few small committees to handle minor details, is apt to prove unsatisfactory unless the plan of the constitution be quite complete before the meeting of the convention. The Federal convention of 1787 used the committee of the whole to a large extent, as did also the Pennsylvania convention of 1789. Some of the earlier constitutions were framed by a small committee which had been given full power to prepare and report a draft of a constitution to the whole convention. This method was adopted by the Revolutionary conventions of Maryland, New Jersey, Pennsylvania and Virginia in 1776, by those of New York and Vermont in 1777, by the Massachusetts general court in 1778, the Massachusetts convention of 1779–80, the Tennessee convention of 1796 and the California convention of 1849. But the usual practice in modern times is for the convention to appoint a number of committees among whom the several sections of the constitution are distributed for consideration and revision, after which such sections are reported to the convention in regular session or in committee of the whole. The more important committees common to three of the most recent constitutional conventions were arrangement and phraseology, banks, corporations, counties and towns, education, suffrage, judiciary, bill of rights, legislature, methods of amendment, municipal government, rules, taxation, submission and address, and miscellaneous. As a rule the members of these committees are appointed by the president of the convention. The Michigan convention of 1908 employed the following procedure: After the convention had been organized, 28 standing committees were authorized, the members of which were appointed by the president. The various propositions submitted by members were read and referred to the proper committee, on being reported by that committee were considered in committee of the whole and when reported by the latter were referred to a committee on arrangement and phraseology. When this last committee had reported upon the proposals, they were put upon their second reading and after this reading were voted upon; if adopted the proposals were again referred to the committee on arrangement and phraseology, which, after harmonizing all the proposals adopted by the convention, reported the complete revision as agreed upon. The committee of the whole then considered this revision section by section and reported to the convention, which then passed the revision to its third reading and voted upon it by articles and as a whole. Thus four different opportunities were presented for the discussion and amendment of proposals, and the committee on arrangement and phraseology had the opportunity to revise the language of each proposal after the committee of the whole had agreed upon it and before it was finally adopted; and as revised the proposals were again sent to this committee to be consolidated into complete and final form.

Submission of Constitutions to Popular Vote.— Since 1840, with a few exceptions, the States have followed the practice of submitting constitutions to popular vote, but the practice can hardly be said to have become fixed, since only about one-half of the State constitutions containing provisions for conventions require that the constitutions framed by these conventions be submitted to the people (California, Colorado, Idaho, Illinois, Maryland, Michigan, Missouri, Montana, Nebraska, New Hampshire, New York, Ohio, Oklahoma, Utah, Washington, West Virginia, Wyoming). Prior to 1784 the only constitutions formally submitted to the people were those of Massachusetts and New Hampshire, though in Pennsylvania in 1790 and in some of the other States a plan was pursued which accomplished about the same purpose; the Vermont constitution of 1786 (and also its later amendments to 1870) and the Georgia constitution of 1789 were ratified by special bodies chosen by the people for that express purpose. Constitutions were submitted for popular approval by New Hampshire in 1792, Connecticut in 1818, Maine in 1819, New York in 1821 (being the first State outside of New England to submit a constitution to the direct vote of the people), Rhode Island in 1824 (this constitution being rejected), Virginia in 1829 (her second constitution), Georgia in 1833 and 1839, Tennessee in 1834, Michigan and North Carolina in 1835, Pennsylvania in 1837–38 and Florida in 1839, but the conventions of Delaware in 1831, Mississippi in 1832 and Arkansas in 1836 did not submit their work to popular vote. Between 1840 and 1860 and from 1870 to 1890, almost without exception, the constitutions framed by conventions were submitted to the people for approval, but since 1890 the practice has been varied. Prior to 1890 there were 38 States, and since that time 10 others have been added to the Union (North Dakota, South Dakota, Montana and Washington in 1889; Idaho and Wyoming in 1890; Utah in 1896; Oklahoma in 1907; and New Mexico and Arizona in 1912). Of the 38 States 12 have held conventions to revise their fundamental laws (Mississippi, 1890; Kentucky, 1890; New York, 1894, 1915; South Carolina, 1895; Delaware, 1897; Louisiana, 1898, 1913; Alabama, 1901; Virginia, 1901–02; Michigan, 1907–08; Ohio, 1912; New Hampshire, 1889, 1902, 1912; Massachusetts, 1917–18), and in 1913 Vermont succeeded in modifying its constitution with the aid of a commission, while the amendments adopted in Oregon and California since 1902 are so numerous and fundamental as to amount virtually to revision. Four States unsuccessfully attempted to revise their constitutions (Rhode Island, 1898, 1899; Connecticut, 1902, 1907; Indiana, 1912; New York, 1915), and referenda submitted to ascertain the popular desire regarding the calling of conventions were negatived in Maryland (1907), Iowa (1900, 1910) and California, Indiana and South Dakota (1914), but Illinois, Indiana, Massachusetts, Nebraska and New Hampshire held conventions in 1917 and 1918.

Of the constitutions adopted since 1890 seven have been submitted without reservation — those of New York (1894), Utah (1895), Alabama (1901), Oklahoma (1907), Michigan (1908) and New Mexico and Arizona (1911), though the submission of the constitutions of Utah, Oklahoma, Arizona and New Mexico were required by the Congressional enabling acts. The constitutions of Mississippi (1890), South Carolina (1895), Delaware (1897), Louisiana (1898 and 1913) and Virginia (1902) were not submitted to the people in any manner (though in the case of Virginia the legislature, when calling the convention, required that its work should be submitted to the people); and the Kentucky constitution of 1891 was altered by the convention after the people had approved it. The Indiana legislature of 1911 drafted a new constitution, but its submission to the people was enjoined by the courts, and in November 1914 the voters defeated a proposal to summon a convention to revise the constitution. Nevertheless the legislature defied the popular mandate by passing the act of 1917 for a convention in 1918. In Ohio the constitution of 1851 was difficult of amendment or revision owing to the necessity of securing on referendum «a majority of all the electors voting at said election.» Finally a convention was authorized and held in 1912 and at a special election in September of that year the convention submitted 42 separate propositions of which 34 were adopted. New Hampshire has no process of amending through the legislature, but every seven years submits a referendum in respect to the calling of a convention. The convention of 1889 submitted seven amendments of which five were adopted; the convention of 1902 submitted 10 amendments of which six were adopted; and the convention of 1912 submitted 12 amendments of which only four were adopted. In Rhode Island any revision recommended must be approved by two successive legislatures. In 1898 a proposed revision made by a commission of 15 persons passed the legislature but was defeated at the polls; with a few changes it was repassed and resubmitted in June 1899 but was rejected by a larger vote. In 1912 another commission of nine persons was appointed to recommend another revision and made its report in 1915, which after being approved by two assemblies was voted upon in 1917. The Connecticut constitution makes no provision for a convention, but in 1901, after a referendum, the legislature summoned a convention, the work of which was rejected at the polls in June 1902. In 1905 the legislature submitted a revised constitution but this too was rejected in November 1907. In Vermont amendments have suffered at popular elections, two out of 23 submitted in 1880 being accepted, none of the nine offered in 1890 and none of the four offered in 1900 being passed, wherefore in 1908 a commission of five was appointed to propose amendments; eight were proposed in January 1910 and after acceptance by two successive assemblies were passed by the voters in 1913. After Louisiana promulgated its constitution in 1898 every session of the legislature witnessed the introduction of numerous amendments until in 1913, owing to the necessity of making new arrangements to fund the bonded debt of the State, a convention was called which added an article respecting the debt, incorporated previously adopted amendments into the constitution and promulgated it without referendum. In 1912 North Carolina appointed a commission which in 1913 proposed 14 amendments to a special session of the legislature but though that body accepted 10 of these they were rejected at the polls in November 1914, though the constitution was later amended in 1916.

In connection with the submission of constitutions to popular approval, some attempts have been made either to enlarge or reduce the electorate for the purpose of voting on such constitutional changes. The legislature alone extended the electorate in New Jersey (1844) and Rhode Island (1841–42), but in 1821 this was done in New York with the aid of the electorate itself, while in Massachusetts in 1780 the convention did the extending with the assent of both legislature and electorate. The conventions of Virginia (1830) and Illinois (1869) had only the assent of the legislature, and the following conventions acted on their own initiative: Louisiana (1845, 1852), Michigan (1835), Texas (1845), Virginia (1851), West Virginia (1863), Tennessee (1834), Kansas (1859) and Arkansas (1868), the Tennessee and Arkansas conventions reducing the electorate in some particulars as well as extending it in others. Electorates have been reduced also by oaths of allegiance required by Reconstruction acts and by the conventions of Maryland (1864), Missouri (1865) and New York (1867).

Constitutional Restrictions upon Conventions.— Generally speaking, the only restrictions upon constitutional conventions are those expressly contained in the provisions of the State and Federal constitutions, or in the absence of such provisions, those implied in such constitutions and those implied from the limited functions of conventions. The existing constitutional organization is not affected by a constitutional convention since the latter acts under the restrictions either expressly or impliedly contained in the constitution in force at the time. Professor Dodd says that the convention «is a regular organ of the State (although as a rule called only at long intervals)— neither sovereign nor subordinate to the legislature, but independent within its proper sphere. Under this view the legislature cannot bind the convention as to what shall be placed in the constitution or as to the exercise of its proper duties . . . [which are] simply to propose a new constitution or to propose constitutional amendments to the people for approval; or in States where the submission of constitutions is not required, to frame and adopt a constitution if they think proper. . . . [Hence] constitutional conventions should not be subject to control by legislative acts.» The new constitution does not become effective until promulgated by the convention, if such be the provisions of the existing constitution, or until ratified by the people, if this action be required. As an organ of the State and as a legislative body a convention must act in accordance with the provisions of the Federal Constitution regarding contracts, *ex post facto* laws and all other restrictions imposed upon the States by that instrument. If a State constitution provide for the revision or framing of the organic law of the State by the calling of a convention, then such convention is impliedly restricted to that one act and the exercise of such powers only as are necessary to accomplish its object. If the State constitution should make no provision for a convention, then such convention acts under the existing constitution and accordingly the governmental departments cannot be superseded or replaced until the new constitution framed by the convention become effective. Hence it is to be presumed theoretically that a constitutional convention is assembled for a limited and definite purpose and neither can nor does usurp the regular legislative, executive or judicial powers of the existing organs of government. (Consult, however, Hoar, R. S., 'Constitutional Conventions,' pp. 164–184). Yet this has not always been the case, particularly during the early Revolutionary and during the Civil War periods, notably in Missouri and the Southern States, though in the former period, as previously stated, the conventions primarily were provisional governments and the work of framing constitutions was only incidental. Analogous conditions obtained in Missouri in 1861–63 and in some of the other Southern States, so that the conventions were probably justified in acting beyond the limits of their regular duties. Some of the Reconstruction conventions in 1865–68, which were called to frame organic laws and establish governments, not only performed these duties but arrogated to themselves all the powers and functions of the regular legislatures. Similarly the conventions of 1890 in Mississippi, of 1895 in South Carolina, of 1898 in Louisiana and of 1901 in Alabama acted as though they possessed powers in excess of those connected with the framing of constitutions. In the South Carolina convention a motion was even made that there be no session of the legislature and that the convention should do its work. The legislative act for the Michigan convention of 1907–08 required that the new constitution be submitted at the April election of 1908, but the convention decided upon the following November, and by mandamus proceedings compelled the Secretary of State to recognize the convention's supremacy. In 1867 and 1894 the New York convention sat beyond the time fixed by the legislature, as did also the Alabama convention of 1901, but while the New York delegates received no extra compensation, the Alabama convention resolved that the pay of its members should continue after the time allotted until the completion of the work. But it would seem that a convention has no power to appropriate money, since in most cases the constitutions provide that money shall be paid from the State treasury only upon a legislative appropriation. In a number of cases such actions have been questioned and have been held invalid by the courts, though other courts have upheld them.

Consult Ashley, R. L., 'The American Federal State' (New York 1908); Bryce, James, 'The American Commonwealth' (rev. ed., ib. 1914); Borgeaud, C., 'Adoption and Amendment of Constitutions in Europe and America' (trans. by C. D. Hazen, ib. 1895); Binney, C. C., 'Restrictions upon Local and Special Legislation in State Constitutions' (Philadelphia 1894); Dealey, J. Q., 'Our State Constitutions' (ib. 1907), 'The Development of the State' (Boston 1909), and 'Growth of American State Constitutions' (ib. 1915); Davis, H., 'American Constitutions' (Baltimore 1885); Dodd, W. F., 'Revision and Amendment of State Constitutions' (ib. 1910); Garner, J. W., 'Amendment of State Constitutions' (in *American Political Science Review,* Vol. I, pp. 213–247, 1907); Hoar, R. S., 'Constitutional Conventions, Their Nature, Powers and Limitations' (Boston 1917); Hitchcock, H., 'American State Constitutions' (New York 1887); Holcombe, A. N., 'State Government in the United States' (ib. 1916); Jameson, J. A., 'Treatise on Constitutional Conventions, Their History, Powers and Modes of Procedure' (4th ed., Chicago 1887); Landon, J. S., 'The Constitutional History and Government of the United States' (Boston 1900); Lobingier, C. S., 'The People's Law, or Popular Participation in Law-making' (New York 1909); Lowell, A. L., 'Public Opinion and Popular Government' (ib. 1913); Morey, W. C., 'First State Constitutions' (in 'Annals of the American Academy of Political and Social Science,' Pub. No. 96, pp. 201–232, Philadelphia 1893); McClure, W. M., 'State Constitution Making' (Nashville 1916); Oberholtzer, E. P., 'The Referendum in America' (rev. ed., New York 1912); Phillips, J. B., 'Recent State Constitution-making' (1904); Schouler, James, 'Constitutional Studies, State and Federal' (New York 1897); Stimson, F. J., 'Law of the Federal and State Constitutions of the United States' (ib. 1908); Thorpe, F. N., 'Constitutional History of the United States, 1765–1895' (Chicago 1901). The text and digests of the State and Federal constitutions may be found in Hough, F. B., 'American Constitutions' (2 vols., Albany 1871); Newman, J. H. (ed.), 'Digest of State Constitutions' (Columbus, Ohio, 1912); Poore, B. P., 'The Federal and State Constitutions, Colonial Charters and Other Organic Laws of the United States' (Washington 1876); Thorpe, F. N., 'The Federal and State Constitutions, Colonial Charters and Other Organic Laws of the States, Territories and Colonies,' issued as 'House Document' 397, 59th Congress, 2d session (7 vols., Washington 1909); and in the 'Manuals' usually issued each year by the several States.

IRVING E. RINES,
Author of 'History of the United States.'

CONVENTIONS, Revolutionary. Where the legal governments of countries have become the very grievances against which people rebel, the latter have no organ of expression save tumultuous or representative popular assemblies. The latter are usually called conventions. Thus, in England, the convention parliament of 1399 deposed Richard II and gave the crown to Henry IV; that of 1660, after the downfall of Richard Cromwell, proclaimed Charles II; that of 1689, after the flight of James II, proclaimed him abdicated and William III king. These were simply parliaments, except that there was no royal authority to call them. In Massachusetts, the convention of May 1689, at the same time as that in England, superseded the Andros government by one of the people. That of South Carolina in 1718, to form a provisional government in place of the proprietary government, is another instance. Of a similar character was the convention by which the first French Republic was declared in 1792, and under which the Revolution was carried on till the establishment of the Directory in 1795. In all these cases, the conventions were administrative bodies, governments pro tem. So during the Revolution, when the royal governors proclaimed the colonial assemblies dissolved, they were in the habit of reassembling as conventions, and they constituted the provincial government until regular constitutions were in force, which in fact they themselves often framed and adopted. The later constitutional conventions, creatures of State law, and limited to the preparation of a plan of government to be afterward voted on, have nothing whatever in common with the above, and are in fact only enlarged consulting boards, representative enough to imply fairly the entire public feeling. Of the first sort were the nullification convention in South Carolina in 1832 (see COMPROMISE OF 1833), and the secession conventions of 1860 and 1861. See CONVENTIONS, CONSTITUTIONAL; UNITED STATES — STATE CONSTITUTIONS; VIRGINIA CONVENTIONS OF THE REVOLUTION.

CONVERGENCE. Cases often occur where two animals of different groups, with a different ancestry and affinities, but with similar habits, so closely resemble each other that not only the ordinary observer, but the experienced naturalist, is deceived by their close resemblance. A familiar example is the whale, which so resembles a fish that by many it is even supposed to be one. Now, the whale is a mammal, bringing forth its young alive, and suckling it. The cetaceans form an order by themselves. There are strong reasons for believing that they are the descendants of some group of land vertebrates which walked on all fours, but which, perhaps driven by competition, were forced to adopt marine life, and became wonderfully adapted to an aquatic life, during this process losing by disuse their hind limbs, while the fore legs became converted into fins. By adaptation to the same medium, a fish and a whale have a similar shape and a strong superficial resemblance. The same is the case with certain extinct whale-like lizards, such as the ichthyosaurs. These, with the plesiosaurs, are now supposed to have descended from some earlier four-footed terrestrial reptiles, which, becoming adapted to oceanic life, assumed a fish-like form.

Cases of convergence resulting from similar burrowing habits are seen in the *Amphibia* and reptiles. Certain amphibians (*Cæcilia*) and several extinct Carboniferous forms, have lost their limbs by disuse; they are worm-like, from adopting the habits of earthworms. Among the lizards the glass-snake (*Ophiosaurus*) and a few other forms have lost their legs in consequence of burrowing in the sand. There is a species (*Bipes*) in which a pair of legs are retained. Snakes have evidently descended from four-legged forms, the boas still retaining vestiges of the hind legs. It is not an easy matter to separate some of the legless lizards from small boas, owing to the convergence in their mode of life.

The thousands and tens of thousands of the boring larvæ of insects, belonging to quite different groups, have strikingly similar forms owing to their similar habits; thus the headless and apodous maggots of flies resemble those of ants, wasps and bees. Among jumping mammals, the kangaroo, the jerboa and jumping mice have similar large muscular hind legs, with a reduction in the number of toes, although they belong to different sub-classes or orders. The kangaroo is a marsupial and we have marsupial or kangaroo rats and mice which can be separated only by an expert from ordinary rodents. The koala mimics the bear, the pouched weasels look like genuine weasels, and so on.

A multitude of other examples can be cited to illustrate the effects of convergent habits, or the influence of similar conditions of life, or adaptation to such and such surroundings. It is most probable that many, if not the large majority, of the cases of mimicry among butterflies and other insects generally attributed to the action of natural selection, are examples of convergence, resulting from exposure to similar physical conditions of light, temperature, etc., which have produced similar styles of coloration, outlines in their wings, etc.

While convergence is not in itself a primary factor of organic evolution, use and disuse are such factors, and convergence in habits or modes of life, resulting in use or disuse of parts, have had much to do with the evolution of such extremely specialized groups as the whales, the snakes, the plesiosaurs and ichthyosaurs, as well as other minor groups of animals.

Convergence is of relatively rare occurrence in plants. However, the phenomenon of heterospory in Pteridophytes is usually supposed to have originated separately in the several groups.

CONVERGENT SERIES. See SERIES.

CONVERSANO, kŏn-ver-sä'nō, Italy, a town in the province of Bari, on a hill, 20 miles southeast of the town of Bari and five miles from the Adriatic coast. It is the seat of a bishop, and has a citadel, a handsome cathedral of the 13th century, several convents, among them San Benedetto, a diocesan seminary, a hospital and a castle which belonged to the family of Acquaviva. The district produces wine, oil, almonds, flax and cotton; and a good trade is carried on in these articles. The foundation of the town is attributed to the Etruscans. Pop. 15,112. Consult Simeon, S., ‹Il duomo di Conversano› (Troni 1896).

CONVERSATION, the oral interchange of ideas among two or more persons. It may be formal or informal, in the latter sense differing little in meaning from «speech or talk.» In its formal sense it is sometimes spoken of as «polite conversation,» and it may cover a wide range of topics. As an art, conversation may be said to have flourished in the courts and palaces of Italy from the Middle Ages onward, and in the salons of France during the 16th, 17th and 18th centuries. In England, in the 17th and 18th centuries, conversation was perhaps at its best. Some of the «polite conversation» of this period has been preserved in the form of «table talk,» but some of this literature might be better described as «monologue.»

CONVERSE, Florence, American writer: b. New Orleans, 30 April 1871. She was graduated at Wellesley College in 1893, and was a member of the editorial staff of *The Churchman* (New York), 1900–08, when she joined the editorial staff of the *Atlantic Monthly*. Author of ‹Diana Victrix,› a novel (1897); ‹The Burden of Christopher› (1900); ‹Long Will,› a romance (1903); ‹The House of Prayer› (1908); ‹A Masque of Sibyls› (1910); ‹The Children of Light,› a novel (1912); ‹The Story of Wellesley,› a history of Wellesley College (1915). She is also editor of the ‹Little Schoolmate Series,› and has written short stories and poems which have appeared in the *Atlantic Monthly, The Century* and other magazines.

CONVERSE, Frederick Shepherd, American composer: b. Newton, Mass., 5 Jan. 1871. He was educated at Harvard University and at the Royal Academy of Music, Munich. From 1899 to 1901 he was instructor in harmony in the New England Conservatory of Music. At Harvard he was instructor in music in 1901–04, and assistant professor 1904–07. His compositions include ‹Sonata in A›; ‹Suite for Piano›; ‹Festival of Pan› (1904); ‹Night and Day›; ‹La belle dame sans merci›; ‹Three Love Songs›; ‹Two Songs for a Soprano Voice›; ‹Quartet in A Minor›; ‹Two Songs for Low Voice›; ‹Silent Noon›; ‹Laudate Dominum›; ‹The Pipe of Desire›; ‹The Sacrifice›; ‹Job,› an oratorio; and ‹Ormazd,› a symphonic poem.

CONVERSE, James Booth, American clergyman and author: b. Philadelphia, Pa., 8 April 1844; d. Morristown, Tenn., 31 Oct. 1914. He was graduated at Princeton 1865 and at Union Theological Seminary, Va., 1870. He was ordained in the Presbyterian ministry in

1871. He edited the *Christian Observer* 1872–79, and the *Christian Patriot* 1890–95. He published 'A Summer Vacation Abroad' (1879); 'The Bible and Land,' an argument in favor of single tax (1889); 'Uncle Sam's Bible, or Bible Teaching About Politics' (1899); 'There Shall Be No Poor' (1906), and also hundreds of articles in newspapers and magazines.

CONVERSION, (1) In theology, is originally the acceptation of Christianity by heathens. It is also used generally for a change from one religion to another, or in a narrower sense for a complete change of attitude toward God, involving a deeper conviction of the ultimate religious and moral truths. Considerable difference of opinion exists within the Christian Church as to the true nature and causes of conversion, especially in the sense last described. The difficulties hinge mainly on the extent of man's co-operation with Divine Grace, and the precise connection between conversion and repentance. In all cases of conversion the criterion of its validity is generally taken to be the resultant change of a man's character as manifested in his mode of life and thought, in the abstention from sin and in devotion to good works.

(2) *In logic.*— In the syllogistic method it is often necessary, in order to reduce the modes of the other figures to those of the first, to change the subject into attribute and the attribute into subject. This operation is called the conversion of propositions. In mathematical propositions the conversion is easily effected and the simplicity of the relations expressed renders evident the methods to be followed. The terms of an equation can be transposed without change, and the terms of an inequality by changing the sign; e. g., $A > B$ because $B < A$ and $A > B$ becomes $B < A$. In the qualitative propositions of logic the relations of the terms are more complex and the rules more precise. Here we have four kinds of propositions — the universal affirmative A, the universal negative E, the particular affirmative I and the particular negative O. How are these propositions converted? A may present two cases, it may express a definition in which the attribute has exactly the same extension as the subject and in this case the attribute can take the place of the subject without changing in any way the quantity of the proposition, e. g. *All men are rational animals* becomes *all rational animals are men.* This is an example of simple conversion. The universal affirmative A may also express the union of an attribute with a whole class of subjects without limiting this attribute to this class. In the conversion of such a proposition this indetermination of the attribute must be maintained e. g. *All men are mortal* is converted into *Some mortals are men.* A is here converted by limitation or *per accidens.* The universal negative E always expresses the exclusion of an attribute without limit from an entire class of subjects; after conversion, the proposition may consequently remain universal, thus, *No man is a quadruped* becomes by conversion *No quadruped is man.* Again we have here a case of simple conversion. The particular affirmative I expresses that an attribute belongs only to a part of the class named in the subject and in conversion this restriction must be maintained; thus, *Some mammals live in water* becomes *some animals that live in water are mammals.* The particular negative O cannot be converted by this simple transposition, for the sense would be altered altogether;— thus *Some man is not just* cannot be converted into *Some one just is not man* and *a fortiori* we may not convert a particular negative into a universal negative and say *No one just is man.* To convert a particular negative proposition therefore we must resort to a third mode of conversion and say, for example, *Some one not just is not some one not man.* This mode of conversion is known as contraposition. We have, therefore, three kinds of conversion, *simple,* in which the quantity of the proposition converted remains the same as that of the proposition to be converted, *limited* or *per accidens,* in which the universal proposition to be converted is changed into a particular proposition, and lastly conversion by *contraposition.* In all cases the quality of the proposition must remain the same. The Scholastics expressed the laws of conversion in the following mnemonic verses:

FEcI Simpliciter convertitur, EvA Per accid.
AltO per Contra. Sic fit conversio tota.

Consult Mill, J. S., 'Logic'; Keynes, J. N., 'Formal Logic' (3d ed., 1894).

Conversion.—(3) In common law, the wrongful assumption of dominion over the goods of another or others. The term conversion does not apply to the wrongful assumption of ownership of money or chattels real. Unauthorized destruction, sale or the use of the personal property of another constitutes conversion. There may be conversion when there is no wrong motive, as where an agent of A sells property believing it to belong to B when it really belonged to C. The wrongful taking may amount to larceny, to trespass or to a crime. Formerly the action for conversion was trover, but this has been abolished by statute both in Great Britain and the United States. The action is now called conversion. Usually the amount of damages recoverable is the value of the goods or the plaintiff's interest where he owns only a part. The plaintiff may either sue to recover the goods or he may claim damages. In the latter case title to the goods vests in the defendant if the judgment is satisfied. The courts are divided as to whether the defendant may mitigate his damages by a tender of the goods to the plaintiff. (4) In equity, an assumption that personal property has been converted into real property or vice-versa when the owner has shown in a proper manner that such was his intention. This is in accord with the well-known maxim that equity regards as done what ought to have been done. Likewise land may be converted into purchase money by a contract to sell made by the owner. Such intention, however, must be clearly expressed by the owner. The subject is of great importance on account of the radically different dispostion of realty and personality under inheritance and succession laws.

CONVERTER. See STEEL, BESSEMER PROCESS.

CONVERTIBLE GOVERNMENT NOTES. See CURRENCY.

CONVEYANCING, a term including both the science and the act of transferring titles to real estate from one person to another. In Hebrew times the modern form of transferring land was well known. In Rome property was exchanged by ceremonial only until the reign of Justinian when a simple legal process was instituted. Sometimes the term is applied in a restricted sense to the cumbrous forms which the feudal system has rendered necessary for the transference and tenure of landed property. When left to shape itself by individual practice, without legislative intervention, there were several causes rendering such conveyancing cumbrous and complex. The theory of the feudal tenures and hierachy remaining unchanged throughout the social revolution which had substantially abolished superiority and vassalage, and brought land out of feudality into commerce, the feudal ceremonies of the Middle Ages were necessarily retained, and they were adapted to fictions and explanations to modern exigencies. It seems strange that not many years have passed since in Scotland, when a parcel of land was bought and sold, a party of men assembled on it and went through the old form of feudal investiture by the delivery of so much earth and stone from the superior bailiff to the vassal's attorney, who took instruments and had the whole recorded at length by a notary of the empire. In England, from the want of the general system of registration known in Scotland, the complexities of conveyancing had become so inextricable, that one of the most approved forms of transference was a fictitious suit and judgment of possession called a fine and recovery. To these various sources of complexity must be added the timidity of conveyancers, who, afraid to commit themselves by attempting to abbreviate or reconstruct the forms which they find in existence, repeat them with additions from time to time as new circumstances must be provided for. Consequently to keep conveyancing within rational bounds the legislature, both in England and the United States, has interfered from time to time, by sweeping away excrescences, and providing brief and simple forms. All instruments under seal are spoken of as deeds, but the term deed is usually understood as applying to conveyances of land. Every person capable of holding lands (excepting idiots, persons of unsound minds and infants), seized of or entitled to any estate or interest in lands, may alien such estate or interest at pleasure, subject to the restrictions and regulations prescribed by law. For a description of the method and procedure of modern conveyancing see Deed; Title-Deed; Title Registration; Title Insurance. Consult Brewster, 'Conveyance of Estates in Fee by Deed' (Indianapolis 1904); Greenwood, 'Manual of the Practices of Conveyancing' (London 1891); Hunter, 'The Dominion Conveyancer' (Toronto 1893).

CONVEYER, a mechanism for conveying something, as loose material, from one place and depositing it at another place distinguished in mechanics from a carrier or elevator. Conveyers may be divided into four general classes: those that operate with endless chains or belts; those that travel along cableways or on a trussed support; those that operate by gravity; those that use a reciprocating surface to throw material forward. These mechanisms have come into very extended use during the past 30 years, being employed in large excavating operations, and in handling coal, grain, cement, ore and similar material. Their manufacture is carried on by a score or more concerns in the United States. One of the simplest and earliest forms of conveyer consists of a pair of endless chains, connected at intervals with cross-pieces or scrapers. These are used to pile up coal for storage. At the centre of what is to be the pile of coal a pole is erected, and to the top of this one end of the conveyer is attached, while the other end is located a little above the ground level, near a steam engine or other motive power. As coal is dumped within the space the scrapers convey it upward toward the pole, and as the lower end of the conveyer may be moved to any point in the circle about the pole, coal dumped anywhere in the circle may be smoothed up and pushed toward the centre, until all lies in a symmetrical pile.

A common form of conveyer consists of a sheet iron trough through which travels a linked belt or chain device having cross strips or scoops. Any loose material dropped in the trough is carried along by the scoops to the point where the linked belt bends for its return.

The Hunt conveyer consists of a series of sheet iron buckets or small cars, hung between parallel lines of flat links, that constitute chains. The buckets swing on trunnions or pivots placed above the centre of gravity, so that they always remain upright, no matter what is the inclination or route of the chains, until they reach a dumping or upsetting mechanism. The links have wheels that run on little tracks, so that the whole constitutes a miniature railway train. The cars or buckets will carry either liquid or dry material. This is called a noiseless conveyer, because the provisions for lubrication do away with all objectionable noise, the latter being a special nuisance with conveyers of the scraper type. The driving wheel of the Hunt conveyer has a series of large pawls, that engage with pins on the links, and provide a slow, but steady and powerful motion. Capacity is obtained by the size of the buckets and not by speed.

Bucket conveyers, more or less similar to those just described, are commonly employed to supply large boiler plants with coal, and to carry away the ashes. In plants located by a waterway, such as that of the Arbuckle sugar refinery, the coal is hoisted in grub-buckets direct from the hold of a vessel, and dumped into the buckets of a conveyer, which transports it to a large pocket or storage room located above the boilers. Thence the coal is fed through automatic stokers to the boilers. Running along below the boilers is another line of conveyer buckets that receive the ashes from the hoppers below the boilers and carry them out to a dumping place, which is often a large elevated hopper, from which the ash wagons can load by driving directly under it and opening a discharge gate. All large railway terminal stations have a coaling-house arranged somewhat on the plan described. The coal is conveyed to overhead storage by the conveyers and is dropped direct into the tenders as they come below. At the plant of the Philadelphia and Reading railroad in Philadelphia monobar conveyers are employed, having a conveying capacity of 120 tons of coal an hour, while the set used to carry away the ashes dumped by the locomotives has a capacity of 20 tons an hour. Nearly all this capacity is needed at times, as the plant is sometimes called upon to load as many as 12 locomotives at once. The monobar conveyer referred to is of the scraper type, the scrapers being attached to a link-belt monobar chain, driven by equalizing gears. Bearing blocks are introduced to reduce the noise.

The Luther ore conveyer has met with considerable sale in Germany. This consists of a series of rectangular sheet-iron pans, moving on roller bearings. It travels quite swiftly and is used for coal, ashes, sand, sugar, etc., as well as ore. When used for carrying coke, or any other material that tends to wear the metal pans, glass bottoms are employed, which give good satisfaction.

For lumber-mills and large wood-working plants a different style of conveyer is manufactured. The Schroeder Lumber Company's works at Milwaukee, Wis., afford a good example, being equipped with a sort of traveling sidewalk, consisting of parallel planks attached at right angles to two malleable iron chain belts. At intervals a thick plank is inserted to keep in place the hard wood lumber that is piled on to this conveyer, which is really a strip of moving floor for transporting boards to another part of the works. For handling waste ends and kindling, a small type of conveyer is used, having hoppers at intervals. Into one set of hoppers the machines that cut up the hard wood drop the end-pieces, etc. Into another set of hoppers the trimmings of soft wood are dropped, and both hard and soft wood are carried up an incline and dumped into an enormous hopper, where the hard and soft wood are kept separate and may be withdrawn from below as wanted for kindling or other purposes.

A conveyer has been devised for loading box cars, the loose material being introduced by a spout at the centre of the car, and carried by the conveyer to the ends, in such a manner that the ends are loaded high up, avoiding waste. These are used on the Hocking Valley Railway.

The belt conveyer is simply a long endless belt, supported at intervals by rollers or idlers, so shaped that they curve up the edges of the belt, enabling it to carry along material without spilling off. The belts are sometimes made of leather, but more commonly of cotton duck, faced with rubber. Such conveyers are used in grain elevators, and for ashes, cement, chips, clay, coal, concrete, earth, ore, oyster shells, tailings and the like. The storage tanks of grain elevators employ belt conveyers almost exclusively, the modern circular tanks having a belt gallery that runs across the tops of the tanks and connects them. The belts thus distribute the grain from the main elevator to the several tanks.

In handling ore, labor is often reduced by means of sorting conveyers, which are made to serve the purpose of sorting tables, at the same time that they serve to convey the ore. These travel slowly, and men stationed at the sides examine the ore as it passes, breaking any pieces deemed too large for the process to which the ore is to be subjected. The large stone-crushing plants very commonly employ belt conveyers, as being the best adapted for handling broken stone. While belt conveyers are used to some extent for handling coal and ashes, they are restricted in use to inclinations of about 20 degrees. For steeper work or direct elevation the bucket type of conveyer has to be employed. All the conveyers that operate with endless chains or belts normally deposit the material at the point where the chains or belts are curved over rollers or sprockets for return. For depositing the material at points along the route, various forms of trippers are manufactured, according to the nature of the conveyer and of the material handled. For filling a conveyer en route there are also in use numerous styles of fillers, many of them being simply spouts leading from hoppers, and others specially designed for the work they are to do.

The type of conveyer used on a cableway is radically different from the foregoing. A wheeled carrier is slung on a supporting rope, usually a steel wire rope, and from this carrier is hung the material to be conveyed. To the carrier is attached a rope, and a conveyer-engine at one end of the cableway pulls the load along to its destination. This is the system followed in coaling vessels at sea. The United States battleships are coaled in this manner during rough weather, the coal being readily carried aboard under these conditions at a rate of 20 tons an hour.

In excavating work, as the New York subway and the Chicago drainage canal, this type of conveyer is in constant use, owing to its economical construction and portability. The system is employed for handling sand, at glass works, etc.; for discharging cargo from a vessel to a shore where there is no wharf; for carrying material over rivers or rough land, as in new sections of country, where there are no good roads; for transporting the material used in building breakwaters and piers; in the building of dams and locks, and for a variety of purposes in connection with mines. A few conveyers have been built for permanent use, in which an overhead truss or bridge with a rail takes the place of the cableway.

The transporter-crane is an enormous structure resembling a gantry crane, having a large trussed framework or steel tower, which supports a long trussed arm that serves as a railway for a car or carrier that does the conveying. This is useful in loading and unloading vessels at docks, and can be used to pass the merchandise completely over low buildings or other obstructions.

A spiral chute is often used to deliver sacks of material to a lower level by gravity. The inclination of the spiral invites friction which prevents the sacks from descending too rapidly. A perpendicular tube is sometimes used for a similar purpose by placing alternate inclines on the sides so that the sack or other object is thrown by gravity alternately to either side, and so descends at a sufficiently delayed speed to prevent its being damaged by the fall.

About 1910 a new type of conveyer appeared on the market, which permitted the transportation of loose material, as ashes, broken stone, etc., around a right angle. Nearly all other conveyers are restricted to a straight line of operations, subject only to slight variation in grade, or sometimes to swinging in the arc of a circle. The Zimmer conveyer, and others of its type, is a rectangular trough of wood or iron, with an oscillating mechanism for moving the bottom boards or sections of the trough. Power is applied to these bottom boards so as to reciprocate them slowly in a forward direction with a quick return. The slow forward motion not only advances the material in the trough, but raises it slightly, and before the material can fall the bottom is pulled down by a quick-acting spring to first position. The material is thus thrown forward by a series of slight jumps, so that it appears to move slowly onward in a mass, and may be made to turn a right-angled corner or any other shorter sharp angle. The Norton and Marcus conveyers employ the same principle. See EXCAVATOR; TELPHERAGE. Consult Zimmer, 'Mechanical Handling and Storing of Material' (1916).

CHARLES H. COCHRANE,
Author of 'Modern Industrial Progress.'

CONVICT LABOR. The introduction of industry into prison life, apart from its use to keep penitentiaries in good order and good repair, is a product of 19th century reforms. Isolated cases it is true occurred before. Mabillon, a Benedictine monk of the 17th century, urged a cellular system of imprisonment, labor in the cells and gardens where prisoners might rest after the day's work. In 1704 Pope Clement XI opened a prison at Rome, where the industrial feature proved successful in the case of boys. A famous prison built in Ghent in 1775 by Viscount Vilain XIV had a well-organized labor system, intended to benefit the prisoner and make him useful to the state. Two years afterward John Howard published his work on 'Prison Reform.' But in practice before the beginning of the 19th century, and well into it, labor was considered in a penological bearing only as offering the possibility of severer punishment, an idea excellently typified by the Roman system of punishing the city slave by sending him to the country tread-mill, or by the terrible toil of the galley slave in Italy and France. This penal point of view was followed by the fiscal interest of the state and to a certain degree intermixed with it; the state will save, and if possible, make money by means of its use of the time and strength of the convict. Then the disciplinary interest became predominant; the convict will furnish us less trouble if we keep him at work. A further step is taken when the object of convict labor becomes moral and the prisoner is put to work to keep him from idleness, spring of so much vice, and to promote his ability to earn an honest livelihood upon his release. In the latest among these stages a distinct effort is made to furnish the convict with decent and pleasant work, and the old scheme of choosing the most revolting and dangerous, the most degrading and monotonous task has been done away with.

Unfortunately the evolution hinted at has not been completed, and traces of each of the ideals mentioned may still be found in the various systems of Europe and the United States. «At hard labor,» for example, is still felt to be a degrading and aggravating addition to the sentence of detention. As far as actual business management is concerned there are two methods of convict labor. In the first, where the «product or profits of labor is shared by the state with private individuals or firms,» we may mention three divisions, sufficiently characterized by their common names: the contract system, the piece-price system and the lease system. The second general class, «systems under which convicts are worked wholly for the benefit of the state» or its parts, again falls into three divisions, the public-account system, the state-use system and the ways and works system. Theoretically the piece-price system is best in the former class, as it keeps discipline in the hands of prison authorities and leaves business to the entrepeneur; moreover it lacks the faults of the contract system, which to a degree interferes with regenerating influences by the very monotony of highly specialized and largely divided industries. In the second class, the public account system, by which goods were made in prison, under the control of regular prison officers, and were sold in a rather haphazard way, has bulked so largely in the public eye, by reason of the attacks made on it by the representatives of free labor (who overlook the fact that cheaper production is offset by slower production), that the other sub-classes have been overlooked. Of these systems the most popular is that which provides that all results of convict labor should be used by the state, and yet this as a system could equally well be attacked by labor unions, which naturally desire to supply state institutions as well as other sources of demand. Although it has but a limited field, the state-use system is growing; it is used in most of the northern States and is authorized by the Federal government for the Fort Leavenworth penitentiary. Another system is the State farm system, under which, as in several southern and some northern States, large plantations are purchased to be operated by the State with convict labor, part of the products being used to maintain the prisoners and the unused portions being sold in the public markets. In the North many of these farms are adjacent to the prisons so that they may be worked by the inmates. The State farm system has been in vogue in Massachusetts many years, and in some of the southern States they are highly profitable to the State. In favor of the system it may be said that the prisoners can be kept in permanent places; they are not exposed to public view; they may be instructed in the ways of becoming self-supporting; they have healthful outdoor life; and the system does not arouse a great amount of public opposition.

The lease system calls for special notice. Its particular habitat is the South, where after the war a remodeling of the penitentiary system was demanded because of the addition of the negro factor to the problem, more than 90 per cent of convicts in most States being negroes. Both expense and the need of outdoor work on the part of the negro made impracticable the continued use of walled penitentiaries, which moreover would have been quite inadequate under new conditions. The lease system came into general use in the late forties, and felons were worked in coal and iron-mills, saw-mills and farms. A chief inspector had general charge, but the responsibility, which was scarcely more than nominal, was upon the lessee and his inspectors and physicians. In many States this system gave rise to horrible abuses. In Georgia it was abolished in 1897 and the State camp system put in its place. The death rate dropped from over 7 to 1.4 per cent in four years. Pay was allowed the prisoner who volunteered to do extra work, and the more brutal forms of corporal punishment abolished. But even in Georgia the county chain gang, made up of minor offenders, under supervision of county road commissioners, is still cruel and vicious. Worse than the county chain gang of Georgia, where only 45 per cent are hired to private individuals, is the system in other States. Alabama, notably by its contract law of 1901, which was declared unconstitutional in 1903 by a United States Circuit Court judge, made possible the following scheme of peonage: A minor offender and often a perfectly innocent person is sentenced to a light fine which the constable offers to pay for a certain number of months' work. At the expiration of this period a new charge is trumped up, or the negro induced to attempt escape, he is again tried and sent to the convict camp or fined for the benefit of the constable and his backers. The universal disapproval of this system in the South and the prompt action of the Federal authorities has led to the abolition of its worst features.

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CONVOCATION, an assembly of the clergy of the Church of England, belonging either to the province of Canterbury or to that of York, to consult on ecclesiastical matters. In both provinces the Convocation consists of two houses, an upper and a lower. In the former sit the bishops and in the latter the deans and archdeacons, along with the proctors, who represent the inferior clergy and the chapters of cathedral churches. In the Convocation of the province of York the usual practice has always been for all the members to sit in one house. Originally convocations were merely ecclesiastical councils that had no special privileges or recognized political status, but gradually they came to assume their present form, being endowed with the right of passing canons, of determining their own taxation, etc. When thus formed into an assembly, having certain political as well as ecclesiastical functions, there was only one Convocation for all England, and this lasted down to the beginning of the 14th century, when the clergy of the two provinces began to meet in separate Convocations. The archbishop of each province has the right of summoning Convocation, but he cannot do so without the royal consent, nor can Convocation pass any canons without the same authority; and from its judicial proceedings there lies an appeal to the sovereign in council. In 1664 the practice of granting subsidies to the Crown, in the exercise of the right of self-taxation enjoyed by the clergy, was discontinued, and since that time their functions have been mostly formal. In the reigns of William III and Queen Anne the Convocation of the province of Canterbury recovered some degree of importance, but in 1717 that temporary influence was again lost, and from that year down to a recent period the practice was to prorogue the Convocation as soon as it had assembled. Since 1852, however, the Canterbury Convocation has met regularly two or three times a year for the transaction of business relating to the Church, and in 1861 it exercised its legislative power, the first time for a long series of years. On the opening of a new Parliament, a new Convocation is summoned. If the Crown desires to refer any question to Convocation, "letters of business" are issued, directing that question to be taken into consideration. Other bodies in touch with the work of Convocation are the House of Laymen and the Representative Church Council, which, however, are without constitutional status in the Church of England.

The term Convocation is also applied to the legislative body of the University of Oxford, composed of all masters of arts, and has the power of acceptance or rejection of statutes passed by the Hebdomadal Council and the Congregation. Consult Trevor, 'The Convocation of the Two Provinces: Their Origin, Constitution, and Forms of Proceeding' (London 1854); Lansbury, 'History of the Convocation of the Church of England' (London 1842).

CONVOLVULACEÆ, kŏn-vŏl-vū-lā'sē-ē, or **BIND'WEEDS,** an order of herbaceous or shrubby plants, usually twining, with plaited tubular corolla, imbricated calyx, alternate undivided or lobed and pinnatifid leaves; bell-shaped flowers, axillary or terminal; five free stamens; and fruit with two or three cells. Many of the order contain a milky and resinous juice possessing purgative properties more or less drastic. Jalap is derived from the *Ipomœa purga,* and inhabitant of Mexico and the southern parts of the United States; and scammony (*C. scammonia*) is a resinous substance possessed of nearly the same properties as jalap. Some species of the order have tuberous and fleshy roots containing a farinaceous and saccharine principle which fits them for food for man and beast. Among these is *Ipomœa batatas,* the sweet potato, originally from India or South America, but now cultivated in all countries where it can stand the climate. *C. scoparius* and *floridus* yield by distillation an essential oil called oil of rhodium, which has a bitter balsamic flavor. Their wood, when powdered, forms an agreeable snuff, and when burned is very fragrant. There are about 40 genera and 900 species widely distributed. The various species of *Cuscuta,* the dodders (q.v.) or bindweeds, which are parasitic on other plants and lack leaves and green color entirely are often considered as belonging to the family.

CONVOLVULIN, kŏn-vŏl'vū-lĭn, the purgative constituent of jalap ($C_{31}H_{50}O_{16}$), obtained from the root by treatment with water and strong alcohol. The alcoholic extract is mixed with water, boiled with animal charcoal, filtered, evaporated and treated with ether as long as anything dissolves. Pure convolvulin is transparent and colorless, brittle at 212° F., fuses at a higher temperature to a clear liquid and is decomposed by strong heating. It is almost insoluble in water and quite so in ether, but soluble in alcohol. It has no taste or smell. In doses of two or three grains it is a powerful purgative, and in larger quantities is fatal to animals. By treatment with alkalis it is converted into convolvulic acid, and by acids into convolvulinol ($C_{15}H_{28}O_{3}$) and glucose.

CONVOLVULUS, the typical genus of the natural order *Convolvulaceæ* (q.v.), or morning-glory family, formerly known as bindweeds. There are about 150 species widely distributed in temperate and tropical climates, some 15 of which are found throughout the southern and western United States.

CONVOY (Fr. *convoyer*, «to accompany»), in nautical language, a fleet of merchantmen bound on a voyage to some particular port or general rendezvous under the protection of a ship or ships of war. The name is also given to the ship or ships appointed to conduct and defend them on their passage thither. It is used in a military sense for a wagon train under an escort of troops, and loosely for the escort itself.

CONVULSIONISTS, or **CONVULSIONARIES**, a sect of religious fanatics originating among the Jansenists of France about 1730. Three years previously a charitable and ascetic deacon of Paris, one Francis, died, and was buried in the cemetery of Saint Médard, in one of the suburbs of the capital. Reports of miracles wrought at his tomb spread among the people, and soon the cemetery was the scene of extraordinary manifestations. As the devotees approached the tomb many were seized with convulsions, or took to dancing and contortions, accompanied by shouts and other eccentric demonstrations. Some of their utterances were accounted as prophecies miraculously inspired by the venerated dead. Most of them were directed to the support of the Jansenist doctrines; but some of the fanatics, by denouncing the throne, and predicting its downfall as well as that of the Church, drew the attention of the government and the ecclesiastical authorities. The cemetery was ordered to be closed; but the same virtue that seemed to be possessed by the tomb was also inherent in earth surreptitiously obtained from it, and the manifestations continued. Imprisonment failed to stop them, but the fanaticism gradually died out in about 20 years. An account of this sect was published by P. F. Mathieu, in Paris in 1864, entitled ‹Histoire des miracles et des Convulsions-Saint Médard.› Consult also Carré de Montgerom, ‹La vérité des miracles opérés à l'intercession de M. de Paris et autres appellans› (3 vols., Paris 1737).

CONVULSIONS. A convulsion is a violent involuntary contraction or series of contractions of the voluntary muscles. It occurs in many conditions, both functional and organic, namely, tetany, hysteria, epilepsy, tetanus (lock jaw), uræmia, eclampsia and chorea (Saint Vitus dance), occurring most frequently in infants. The convulsion may be local or general, tonic or clonic in character, and is due to a hypersensitive nervous system or relatively greater excitability of the brain and the undeveloped power of inhibitory control. In children it may be reflexly due to teething, phimosis, rachitis, eating of indigestible articles of food, intestinal worms, injuries to the body, constipation, foreign bodies in the ear and nose, and fever from any cause or toxæmia of any kind. Convulsions at the time of birth may be due to cerebral hæmorrhage following a forceps delivery, or brain tumor, brain abscess and hydrocephalus.

Uræmia is the result of kidney disease, as is also eclampsia which occurs during the pregnant state. The convulsions are tonic and clonic in character, frequently occur without warning and in people apparently in perfect health the attack may come on at any time — the eyes become fixed at first and then roll from side to side, the convulsive movements first appear about the mouth, which begins to twitch and is drawn to one side, the entire face becoming distorted. They extend rapidly to the arms, the body, and then finally to the legs. The breathing is stertorous, the face congested and flushed, the patient foams at the mouth and often bites his tongue. During the convulsion, which may last from a few seconds to a half hour, the patient is profoundly unconscious, and after the movements cease passes into a condition of coma which lasts for a longer or shorter period. The convulsions are frequently repeated.

Chorea occurs most frequently in children, and the convulsions or twitchings are of a clonic character and affect groups of muscles. The twitchings may be slight or very severe so as to interfere with speech, eating, locomotion and coherent voluntary bodily movements. It may affect one side of the body, as one arm and leg, when it is known as hemichorea, or it may affect both sides. The twitching movements are greatly exaggerated when the patient endeavors to perform a voluntary act. Consciousness is always present.

In epilepsy (q.v.) the convulsions resemble those described under uræmia. There seems to be a regular order of movements followed out, preceded by aura, the patient becomes unconscious, froths at the mouth, bites his tongue, the pupils dilate and there is an involuntary passage of urine and fæces. The convulsions last a few minutes, and on recovery, the patient is left in a semi-comatose condition, complains of headache, and then falls off into a restless sleep. The attacks also frequently occur at night while asleep.

Hysteria shows a great variety of manifestations. The convulsions may involve only the lower extremity or the head and neck. There is a condition known as hystero-epilepsy. There is no aura, the attacks are much prolonged and purposeful and tonic in character. The bladder and rectal functions are not disturbed. There is no complete loss of consciousness

The patients seldom injure themselves, in fact they seem to protect themselves from injury.

In children the convulsions usually begin suddenly, although they may be preceded by a rolling of the eyes upward and sideways and by slight twitching of the muscles of the face. Unconsciousness soon supervenes, the eyes remain fixed and staring, the head is thrown backward, and the entire body stiffens out only to be followed by clonic contractions. There is a series of contractions and relaxations. The face assumes different expressions or grimaces, the teeth become set, there is a frothing at the mouth and the color of the face becomes dusky and cyanotic. The breathing is labored and heavy, urine and fæces may be voided involuntarily. After going through several convulsions the child soon passes into a deep sleep and then awakens with an apparent interest in his surroundings. These convulsions usually indicate the approach of some disease or reflex irritation somewhere, and should be considered as a serious condition until the cause is discovered. The convulsion in the child is analogous to the chill in the adult, it precedes such diseases as pneumonia, cerebrospinal meningitis, grippe, intestinal disturbances, etc. A convulsion is a symptom and not a disease, and therefore it is never directly the cause of death.

As to treatment, it is of great importance to control the convulsion before trying to find out its cause. In children this is done by placing the child in a bath of hot water with mustard and keeping it there until the skin is reddened. If the convulsions persist, the child should be put under the influence of chloroform until the convulsive tendency has disappeared. When the convulsion is controlled, search is then made for the cause. If the digestive tract is found to be at fault, the child is given a dose of castor oil, and a high rectal enema of soapsuds is given as a matter of routine to empty the lower bowel. After the bowel is cleared and the child still shows a tendency toward convulsions, a rectal injection of 10 grains of sodium bromide and 3 grains of chloral hydrate may be given for a child five years old. In very severe cases it is justifiable to give a hypodermic of morphia in proper dose. The room should be kept noiseless and an icebag placed to the head. It is always a good plan to examine the enema stool in search for intestinal parasites, foreign bodies or undigested particles or lumps of food. A child who is very nervous and is easily excited by physical impressions should be kept very quiet. Genital abnormalities should be properly treated, a child with a tight or adherent prepuce when circumcised becomes free from convulsions. Foreign bodies should be removed from the ears and nose. A child with rachitis should be built up, kept out of doors in the sun, and given the proper kind of food and tonics. Hydrocephalus may be treated by tapping the ventricles of the brain through the anterior fontanelle and so drain off some of the fluid or tap the spinal cord to drain it off that way and so relieve the intra-cranial pressure. Anæmia and malnutrition should be treated if found to be the cause.

Convulsions due to tumors of the brain or brain abscess cannot be treated unless they be in a position accessible to the surgeon. Convulsions due to uræmia are very serious and need very urgent treatment; a mouth gag should be inserted into the mouth to prevent the patient from biting his tongue, blood letting is done from one of the veins at the bend of the elbow to lower the blood pressure and rid the system of a certain amount of toxins; usually 500 c.c. is withdrawn at one time, hot packs are given or the electric baker is placed over the patient to induce profuse perspiration, pilocarpine one-tenth grain by hypo is sometimes used but is not safe. In eclampsia the uterus is emptied as soon and as rapidly as possible, using ether and oxygen as anæsthetic; chloroform should never be used. Ether and oxygen are used to control the convulsions until the time for operation. A mouth gag is the first thing to be placed in the mouth. Veratrum viride, 5 minims by hypo every one-half hour, is given to lower the blood pressure. Magnesium sulphate, a dram to the pint, is administered usually post-partum intra-venously and frequently repeated. In epilepsy the convulsions usually do not last long. Prevent the patient from injuring and biting his tongue. Loosen all his clothing and see that he lies in a well-padded place and away from solid objects. Chloroform is used if the convulsion is very severe. Epileysy found to be due to depressed fracture of the skull is often cured of any future attacks when operated upon and a button of bone removed, the intra-cranial pressure being thus relieved. In chorea, the child should be kept as quiet as possible, free from all mental and physical strain. Its food should be easily digested and nourishing; arsenic in the form of Fowler's solution is the best remedy. If traces of rheumatism are present it is combined with the salicylates. Bromides and chloral are given to quiet and control the spasmodic movements. Iron is also given as a tonic. In hysteria the best way to check the convulsion is by dashing a glass of cold water into the patient's face. A hypo of apomorphine, one-tenth grain, causes sickness of the stomach and immediately arrests the attack. A teaspoonful of aromatic spirits of ammonia may be given. Convulsions due to meningitis, tetanus, brain abscess and tumors of the brain are treated along general principles.

Henry H. Beinfield, M.D.

CONWAY, Hugh. See Fargus, Frederick John.

CONWAY, Moncure Daniel, American clergyman and author: b. Stafford County, Va., 17 March 1832; d. New York 1907. He was graduated at Dickinson College in 1849, entered the Methodist ministry in 1850, and later studied at the Harvard Divinity School. He had become imbued with rationalistic ideas and attempted to preach them on his return to Virginia, but was obliged to leave the State. He became pastor of a Unitarian church in Washington, D. C., but was obliged to leave this charge, owing to his opposition to slavery. He secured another pastorate in Cincinnati, and while there wrote several volumes and edited the *Dial*. In this periodical and later in *The Commonwealth* of Boston he earnestly advocated emancipation, and in 1863 went to England to explain the cause of the Civil War. From 1863 to 1884 he was minister at South Place Chapel in London, England, and again, 1892–97. He returned to America near the close of the century and made his home in New York. His published books include ‘Tracts for To-day’ (1857); ‘The Rejected Stone’ (1861); ‘The Golden Hour’ (1862); ‘Testimonies Concerning Slavery’ (1864); ‘The Earthward Pilgrimage’ (1870); ‘Sacred Anthology’ (edited) (1872); ‘Idols and Ideals’ (1874); ‘Travels in South Kensington’ (1875); ‘Demonology and Devil Lore’ (1879); ‘The Wandering Jew’ (1880); ‘Thomas Carlyle’ (1881); ‘Emerson at Home and Abroad’ (1882); ‘George Washington and Mount Vernon’; ‘Omitted Chapters of History Disclosed in the Life of Edmund Randolph’ (1887); ‘Pine and Palm,’ a novel (1887); ‘Life of Nathaniel Hawthorne’ (1890); ‘Prisms of Air,’ a novel (1891); ‘Life of Thomas Paine’ (1892); ‘Barons of the Potomac and the Rappahannock’ (1892); ‘Centenary History of South Place Chapel’ (1893); ‘Solomon and Solomonic Literature’ (1899); ‘Autobiography’ (1904); ‘My Pilgrimage to the Wise Men of the East’ (1906); ‘Addresses and Reprints, 1850–1907’ (Boston 1909). He edited the ‘Works of Thomas Paine’ (1893–96).

CONWAY, Robert Seymour, English classical philologist: b. Stoke Newington 1864. He was educated at Caius College, Cambridge. He was Fellow of Gonville and Caius College in 1888–94, classical lecturer in Newnham College in 1887–93, and professor of Latin, University College, Cardiff, Wales, in 1893–1903, when he took the corresponding chair in Victoria University, Manchester. He wrote ‘Verner's Law in Italy’ (1887); and ‘Virgil, an Inaugural Lecture’ (1903), collaborated in the translation of ‘Brugmann's Comparative Grammar’ (1888–95); ‘The Restored Pronunciation of Greek and Latin’ (1896); ‘The Italic Dialects’ (1897); ‘Dialectorum Italicarum Exempla’ (1898); ‘The Pre-Hellenic Inscriptions of Praesos’ (1903). He is a frequent contributor to classical periodicals.

CONWAY, Thomas, Irish soldier of fortune: b. Ireland, 27 Feb. 1733; d. about 1800. He was educated in France, and entering the army there became a colonel. He came to America in 1777 and offering his services to the Continental Congress was appointed brigadier-general and subsequently inspector-general, with the rank of major-general. He intrigued to have Washington superseded by General Gates, and he and his associates were known as "Conway's Cabal." He resigned in 1778, went to France and was made governor of Pondicherry and the French settlements in Hindustan. In 1792 he was appointed commander of the Royalist forces in the south of France, but on the success of the Revolutionists fled from the country.

CONWAY, Sir William Martin, English art critic, explorer and mountaineer: b. Rochester, England, 1856. He was educated at Trinity College, Cambridge; professor of art at University College, Liverpool, 1885–88, and Slade professor of fine arts at Cambridge 1901–04. In 1892 he traveled extensively in the Himalayas and in the Alps in 1894; he explored the interior of Spitzbergen in 1896–97, and the Bolivian Andes in 1898, as well as the glaciers of Tierra del Fuego. Among the high peaks he has ascended are one in the Himalayas of 23,000 feet, and Aconcagua, Illimani and Sorata in the Andes. He was knighted in 1895, received a gold medal for mountain surveys at the Paris Exhibition in 1900, and the founder's medal of the Royal Geographical Society, 1905. He has published ‘Woodcutters of the Netherlands in the 15th Century’ (1884); ‘The Artistic Development of Reynolds and Gainsborough’ (1886); ‘Early Flemish Artists’ (1887); ‘Literary Remains of Albrecht Dürer’ (1889); ‘Dawn of Art in the Ancient World’ (1891); ‘Climbers' Guides to the Alps’ (1890); ‘Climbing and Exploration in the Karakoram-Himalayas’ (1894); ‘The Alps from End to End’ (1895); ‘The First Crossing of Spitzbergen’ (1897); ‘With Ski and Sledge over Arctic Glaciers’ (1898); ‘The Bolivian Andes’ (1901); ‘Aconcagua and Tierra del Fuego’ (1902); ‘Great Masters’ (1904); ‘Early Voyages to Spitzbergen’ (1904); ‘No Man's Land’ (1906); ‘The Sport of Collecting’ (1904); ‘The Crowd in Peace and War’ (1915).

CONWAY, Ark., county-seat of Faulkner County, on the Saint Louis, Iron Mountain and Southern Railroad, about seven miles east of the bend of the Arkansas River at Sevier and 25 miles northeast of Little Rock in an air line. The town has an extensive trade in cotton, lumber, flour and cotton-seed oil, cotton compress, broom factory and excelsior works. It is lighted by electricity, and governed by a mayor and council. The educational advantages are among the best of any of the agricultural towns of the State. The Methodist Episcopal Church South maintains Hendrix College, established in 1884. Arkansas State Normal School and Central Baptist College for Women are located there. The town was founded in 1871 and incorporated three years later. Pop. 2,794.

CONWAY, N. H., town in Carroll County, famous for the beauty of its natural scenery, which makes its villages among the most popular summer resorts in the White Mountain region. The town lies along the Saco River, on the Boston and Maine Railroad, about 75 miles north by west of Portsmouth. There are extensive granite quarries in the town and a few lumber mills. It contains a ribbon-peg factory, spool mill, box factory and canning interests. The waterworks are municipally owned. Pop. 3,413. Consult Eastman, ‘East of the White Hills.’

CONWAY, CONWY, or ABERCONWAY, Wales, town and parliamentary borough in the county of Carnarvon, about 14 miles east-northeast of Bangor. It is picturesquely situated on the left bank of the Conway River, and is surrounded by an old wall still in good preservation, 12 feet thick, and fortified with towers and battlements. The old castle of Conway, erected toward the end of the 13th century by Edward I, is one of the most magnificent structures of the kind in England. It is one mile in circumference and was fenced with 21 round towers. Many parts of it are still entire, including the state hall, which is 130 feet long, 32 broad and 20 high. A suspension bridge was thrown over the river in 1826, and in 1848 another bridge was built by Robert Stephenson for the accommodation of the Chester and Holyhead Railway. It is a wrought-iron tubular bridge on the same principle as the Britannia bridge over the Menai Strait. Conway unites with Carnarvon, Bangor, Criccieth, Nevin and Pwllheli in returning one member to Parliament. Curfew is still rung in Conway. Pop. 5,242.

CONWAY, a river of Wales, rising from two head-streams, one in the southeast of the county of Carnarvon and the other in the southwest of the county of Denbigh, which unite about 15 miles south of Conway. At Conway it is half a mile broad at spring tides which rise here 21 to 24 feet. The united stream flows north, separates Carnarvon from Denbighshire, and falls into Beaumaris Bay after a course of from 25 to 30 miles. It is navigable to Llanrwst, or about 10 miles from its mouth. The Conway has been famous for its pearls since Roman times.

CONWAY CABAL, 1777–78, in American history: an intrigue headed by Horatio Gates, Charles Lee, Thomas Mifflin (then quartermaster-general) and James Lovell of Boston (Gates' confidant, and an unsparing contemner of Washington); with Thomas Conway as a tool. The prime object was to displace Washington by Gates; and there were plenty of other ambitions which hoped to reap advancement in the overturn. It gained its momentum from that popular clamor for immediate success in the war. The faction endeavored to prove the superiority of Gates over Washington as commander by contrasting the victories of the former at Saratoga with the almost contemporaneous reverses of the latter at Brandywine and Germantown. In November 1777 the Board of War was reconstituted: Gates was made president, with liberty to serve in the field at will — that is, put over Washington's head with power to supersede him; Mifflin was made a member of the Board of War and shortly afterward Conway was made inspector-general over Washington's emphatic advice to the contrary. A very petty series of letters maligning Washington was circulated, and other minor intrigues resulted. Then Gates undertook to send Lafayette on a senseless expedition to Canada, promising him abundant men and supplies; but he so utterly failed of providing either and the scheme was so disapproved by the public that it pricked the Gates bubble. Conway resigned conditionally; Gates and Mifflin were removed from the Board of War and Gates was assigned to the forts on the Hudson, with emphatic warning to report to Washington. The adherents or helpers of the cabal disclaimed all connection with it, and Conway shortly went to France. Consult Fiske, ‘The American Revolution’ (Vol. II, Boston 1893).

CONWELL, Russell Herman, American Baptist clergyman, university president and lecturer: b. Worthington, Mass., 15 Feb. 1842. He studied law at the Yale and Albany Law schools, and was an officer in the Federal army in the Civil War. He was immigration officer of Minnesota in Germany in 1867–68; foreign correspondent, the New York *Tribune* and Boston *Traveler*, 1868–70; and practised law in Boston 1870–79. He was ordained to the Baptist ministry in 1879; was pastor of Grace Baptist Church, Philadelphia, 1881–91; and has been pastor of the Baptist Temple since 1891. He founded Temple University in 1888 and is still its president. He founded the Samaritan Hospital in 1891. He has given his celebrated lecture, ‘Acres of Diamonds’ over 5,000 times. He is a member of the Union League, Manufacturer's Club, New England Society and Yale Alumni. Among the books he has published are ‘Life of Bayard Taylor’ (1888); ‘Why the Chinese Emigrate’ (1874); ‘Woman and the Law’ (1875); ‘Life of C. H. Spurgeon’ (1893); ‘Acres of Diamonds’ (1888); ‘Present Successful Opportunities’; ‘Lives of the Presidents’ (1878); ‘Life of James G. Blaine’; ‘The New Day’ (1902), etc.

CONY, or CONEY, an old name for the rabbit; used also in the English version of the Bible as a translation of a Hebrew word probably meaning the *Hyrax syriacus*, a rabbit-like animal common in Syria and Palestine, inhabiting clefts of rocks.

CONYBEARE, Frederick Cornwallis, English Orientalist: b. 1856. He was educated at Tonbridge School and at University College, Oxford, of which he became scholar in 1875 and Fellow and praelector in 1881. He was made a Fellow of the British Academy in 1903, an officer of the French Academy in 1906, and honorary doctor of theology at Giessen in 1907. In his special field, Armenian language and literature, he came to be recognized as probably the foremost authority of his time; but he wrote on religion and religious history. His published works include ‘Ancient Armenian Texts of Aristotle’ (1892); ‘The Key of Truth, a Manual of the Paulician Church of Armenia’ (1898); ‘Roman Catholicism in International Politics’ (1901); ‘Rituale Armenorum’ (1905); ‘Old Armenian Texts of Revelation’ (1906); ‘Myth, Magic and Morals: a Study of Christian Origins’ (1909); ‘New Testament Criticism’ (1910); ‘The Historicity of Christ’ (1914).

CONYBEARE, kŭn'ĭ-bėr, **John**, English prelate: b. Pinhoe, near Exeter, 31 Jan. 1692; d. Bath, 13 July 1755. He studied at Exeter College, Oxford, received orders, and was curate at Fetcham in 1717. He returned to Oxford in 1718, became successively tutor in his own college, preacher to his majesty at Whitehall, rector of Saint Clement's, Oxford, and in 1730 master of Exeter College. In 1732 he published his celebrated ‘Defense of Revealed Religion,’ in answer to Tindal's ‘Christianity as Old as the Creation.’ In that year also he was appointed dean of Christ Church; and in 1750 succeeded Butler as bishop of Bristol.

CONYBEARE, William John, English clergyman: b. England, 1 Aug. 1815; d. Weybridge, Surrey, 1857. He published ‘Perversion,’ a religious novel (1856); and ‘Essays Ecclesiastical and Social,’ but is principally known for his joint authorship with Dean Howson of the popular ‘The Life and Epistles of Saint Paul’ (1851).

CONYERS, kŏn'yėrz, Ga., city and county-seat of Rockdale County, 30 miles southeast of Atlanta on the Georgia Railroad. Cotton growing and granite quarrying are important industries. The city also has a cotton factory, an oil mill, bottling works and a flouring mill. The city owns the waterworks. Pop. 1,919.

CONZE, kōnt'se, **Alexander Christian Leopold**, German archæologist: b. Hanover 1831; d. 1914. He received his education at Göttingen and Berlin. From 1863 to 1869 he was professor of archæology at Halle, from 1869 to 1877 at

Vienna, and at Berlin from 1877 to 1887. He was made director of the Berlin Museum and in 1887 became general secretary of the German Archæological Institute. His published works include ‘Reise auf den Inseln des thrazischen Meeres’ (1860); ‘Archäologische Untersuchungen in Samothrake’ (2 vols., Vienna 1875–80); ‘Beiträge zur Geschichte der griechischen Plastik’ (2d ed., Halle 1869); ‘Die Ergebnisse der Ausgrabungen zu Pergamon’ (Berlin 1880–88); ‘Die Arbeiten zu Pergamon, 1886–98’ (Athens 1899); ‘Die Kleinfunde aus Pergamon’ (Berlin 1902).

COOCH BEHAR, kooch bā-hār', or **KUCH BEHAR**, India, a native state and in political relation with the government of Bengal. It forms a level plain of triangular shape, intersected by numerous rivers which make a great part of it almost hopelessly waterlogged, and is entirely surrounded by British territory. The greater portion of the soil is fertile and well cultivated. Rice, jute and tobacco are the principal crops. The mean annual temperature is 78 degrees, and the rainfall 123 inches. It was at one time a part of the ancient kingdom of Kamarapu. British connection began in 1772. The chief town, Cooch Behar (pop. 11,000), contains some handsome public buildings and a splendid new palace of the Maharajah, and has a population of 9,535. Area of state 1,307 square miles. Pop. 593,000.

COODIES, The, in the political history of the United States, a nickname applied to those members of the Federalist party in New York who favored the War of 1812. It was adopted from the fictitious name, Abimelech Coody, assumed by the leader of the faction, Gulian C. Verplanck (q.v.) when writing in the public prints. Consult Hammond, ‘The History of Political Parties in the State of New York’ (4th ed., Cooperstown 1846).

COOK, Albert John, American naturalist: b. Owosso, Mich., 30 Aug. 1842. He was graduated at Michigan Agricultural College 1862, and was professor of zoology and entomology there 1869–93, when he became professor of zoology in Pomona College, Claremont, Cal. In 1911 he was appointed State commissioner of horticulture for California. He was one of the first to make kerosene emulsion (1877), and to advocate and demonstrate the use of the arsenites as a specific against the codling moth (1880). He has published ‘Injurious Insects of Michigan’ (1873); ‘Manual of the Apiary’ (1876; 14th ed., 1886); ‘Silo and Silage’; ‘Maple Sugar and the Sugar Bush’; ‘Birds of Michigan’; ‘California Citrus Culture’ (1913).

COOK, Albert Stanburrough, American scholar: b. Montville, N. J., 6 March 1853. He was graduated at Rutgers College 1872, and studied at Göttingen and Leipzig 1877–78, London and Jena 1881–82. He was professor of English in the University of California 1882–89, when he became professor of the same in Yale University. He organized the department of English at the Johns Hopkins University (1879–81); brought the University of California into closer relations with the high schools of the State (1884–89); translated into English the first thoroughly scientific grammar of Old English; established a new standard of editing for Old English texts; laid a firm basis for the study of the Old Northumbrian dialect, the modern Scotch and Northern English; was instrumental in having the study of English texts, as distinct from reading and composition, made a national requirement for admission to college 1894; has specialized on the study of the Bible in English; has edited books on the criticism of poetry; was the first to edit a volume of Ginn's Athenæum and Albion series and of Heath's *Belles Lettres* series, Old English division; founded the Concordance Society in 1906, of which he has ever since been president, and edited ‘Concordance to Gray’ (1908), ‘Concordance to Beowulf’ (1910); was president of the Modern Language Association of America 1897; has edited a series of 55 volumes, ‘Yale Studies in English’; has established a probable date for the two chief Runic monuments of Great Britain (‘The Date of the Ruthwell and Bewcastle Crosses,’ 1912); has published a ‘Literary Middle English Reader’ (1915); a translation of Sievers' ‘Old English Grammar’ (1885). His publications further include ‘The Phonological Investigation of Old English’ (1888); ‘The Bible and English Prose Style’ (1892); ‘The Art of Poetry’ (1892); ‘First Book in Old English’ (1894; 3d ed., 1903); ‘The Artistic Ordering of Life’ (1898); ‘Biblical Quotations in Old English Prose Writers’ (1904, 1913); ‘Higher Study of English’ (1906); ‘Concordance to Beowulf’ (1910) and has founded two prizes in poetry, one at Yale University and the other at the University of California.

COOK, Sir Edward Tyas, English journalist: b. Brighton, Sussex, 12 May 1857. He was educated at Winchester College and New College, Oxford, and was subsequently editor of the *Pall Mall Gazette*, 1890–92; ‘Westminster Gazette,’ 1893–96; and the London *Daily News*, 1896–1901. He has published ‘Popular Handbook to the National Gallery’; ‘Studies in Ruskin’; ‘Popular Handbook to the Tate Gallery’; ‘Life of Ruskin’ (1911); ‘Homes and Haunts of Ruskin’ (1912); ‘Life of Florence Nightingale’ (1913). He was knighted in 1912.

COOK, Eliza, English writer of verse: b. Southwark 1818; d. Wimbledon, Surrey, 24 Sept. 1889. She began at an early age to contribute articles to various periodicals, and her first volume of verse, which appeared in 1840, was very successful. In 1849 she published ‘Eliza Cook's Journal,’ which appeared weekly until 1854. She published ‘New Echoes, and other Poems’ (1864), and in the same year received a pension from the Civil List. By their simplicity of theme and treatment her poems obtained a large measure of popularity in England and America. Her most familiar poem is ‘The Old Arm Chair.’ A complete edition of her poetical works appeared in London in 1870 and in New York in 1882.

COOK, Francis Augustus, American naval officer: b. Northampton, Mass., 10 May 1843. He was graduated at Annapolis 1863, and served for two years with Farragut in the West Gulf squadron. He became lieutenant-commander 1868; commander 1881 and captain in 1896. During the Spanish-American War he commanded the *Brooklyn*, the flagship of Commodore Schley's flying squadron, which took so conspicuous a part in the battle of Santiago, 3 July 1898, when Cervera's fleet was destroyed. He was relieved of sea duty after the war and received an appointment to the United States Naval Examining Board. He was retired in 1903.

COOK, Frederick Albert, American physician and explorer: b. Callicoon Depot, Sullivan County, N. Y., 10 June 1865. He was graduated at New York University 1890. He was surgeon of the Peary Arctic expedition 1891–92, and of the Belgium Antarctic expedition 1897–99. He has received the decoration of the Order of Leopold, the gold medal of the Belgian Royal Society and the silver medal of the Belgian Royal Geographical Society. He claimed to have reached the North Pole on 21 April 1908. Upon his return in 1909 «from the Pole» — as he said — he was received with great honors at Copenhagen, Denmark, and then, hastening to New York, he at once began making large sums of money by his writings and lectures. Doubts soon began to arise as to the veracity of his story — his companion on the journey he made in 1906 to Mount McKinley, Alaska, made an affidavit that no ascent of that mountain was made as described in Cook's narrative, and the Eskimos who were supposed to have been his companions on the dash to the Pole told the Peary party that they had spent the winter of 1907–08 at Jones Sound. This was followed by the sworn statement of a man who had been hired to prepare for Cook a set of observations for latitudes and longitudes on his journey to the Pole, to send with his other data to the University of Copenhagen for examination. In the meantime Cook disappeared from view, and the learned scientists at Copenhagen decided that his proofs were not sufficient; but the sale of his book 'My Attainment of the Pole' (1909; 3d ed., 1913), was very large. In 1913–14 he lectured in England. He has written articles for the leading magazines, describing life in the polar regions, and a valuable account of his Antarctic experiences and scientific observations, entitled 'Through the First Antarctic Night' (1900); 'To the Top of the Continent' (1908); 'North Pole and Bradley Land,' with E. S. Balch (1913).

COOK, George Hammell, American geologist: b. Hanover, N. J., 5 Jan. 1818; d. New Brunswick, N. J., 22 Sept. 1889. He graduated at Rensselaer Polytechnic Institute, Troy, N. Y., 1839, was senior professor there 1842–46, when he went to Rutgers College, remaining there until his death. At different periods of his service he taught chemistry, natural history, geology and agriculture. In 1864 he was elected vice-president of the college, and appointed State geologist the same year. He was instrumental in developing the Onondaga salt deposits in New York. In 1880 he was made director of the New Jersey agricultural experiment station. His writings consist chiefly of special contributions to scientific journals, his annual reports as State geologist, and a 'Geology of New Jersey,' published by that State in 1868. Neilson has published a biography of him.

COOK, James, English navigator: b. Marton, North Riding of Yorkshire, 27 Oct. 1728; d. Hawaii, 14 Feb. 1779. After a meagre education he was apprenticed to a shopkeeper at Staithes, a small town on the sea-coast. Here he acquired a taste for the occupation of a sailor, and at the commencement of the French War in 1755 entered the royal navy. In 1759 he was made master of the *Mercury,* which belonged to the squadron sent against Quebec, and performed the hazardous service of taking soundings in the river Saint Lawrence opposite the French encampment. He also made a chart of the river Saint Lawrence below Quebec in a very satisfactory manner. The charts and observations which he made of the coasts of Newfoundland and Labrador, published in 1776–78 and distinguished for their accuracy, introduced him to the notice of the Royal Society.

This organization appointed him in 1768 to the command of a vessel destined to convey to the Pacific Ocean persons employed by government to make observations on the transit of Venus. He left Plymouth on 26 Aug. 1768, touched at Madeira and Rio de Janeiro and doubled Cape Horn. The transit of Venus, 3 June 1769, was advantageously observed at Tahiti; the neighboring islands were explored, and Cook then sailed for New Zealand. Six months were employed in examining the shores of the islands; after which he took his departure for Australia, the eastern coast of which he attentively surveyed as well as of New South Wales. On his return in 1771 he was raised to the rank of master and commander in the navy. An account of the voyage, drawn up by Dr. Hawkesworth, was speedily published, and a second expedition was planned to explore the Antarctic regions.

On this occasion two ships were employed the *Resolution,* of which Captain Cook had the command, and the *Adventure,* under Captain Furneaux. After proceeding as far south as the latitude of 71 degrees, where a barrier of ice opposed any further progress, discovering the island of New Georgia in lat. 54° S., and visiting Tahiti and other places, encircling over 20,000 leagues, Captain Cook returned to Great Britain in 1775. The captain had taken such excellent precautions for his crew that only one man had died. He communicated to the Royal Society a paper describing the regulations and remedies which he had adopted and was chosen a fellow of that body, and his experiments were rewarded by the Copleian gold medal. Government rewarded him with the rank of post-captain in the navy, and the appointment of captain in Greenwich Hospital. The narrative of this voyage was drawn up by Captain Cook himself, and was published at London in 1777. In July 1776 he sailed on an expedition to ascertain whether any communication existed between the Atlantic and Pacific oceans in the Arctic regions. In this voyage he again commanded the *Resolution,* which was accompanied by the *Discovery,* and explored a considerable extent of the western coast of North America. He also discovered the Sandwich Islands, and to Hawaii, one of this group, he returned from his American survey to pass the winter of 1778. In February Captain Cook sailed for Kamchatka, but was compelled by an accident to put back to Hawaii. A boat having been stolen by one of the islanders, the captain went on shore to seize the king of Hawaii, and keep him as a hostage till the boat was restored. The people, however, were not disposed to submit to this insult; their resistance brought on hostilities, and in attempting to reach his boat Captain Cook and some of his attendants became victims to the fury of the irritated islanders and were slain, 14 Feb. 1779. A complete account of this third voyage appeared in 1784. The first two volumes were by Captain Cook himself, and the third by Capt. James King. A medal in commemoration of him was struck by order of the Royal Society; his eulogy was pronounced in the Florentine Academy and was made a prize subject by one of the French scientific societies. Consult Kippis, 'Life of Captain James Cook' (1788); Besant, 'Captain Cook' (1890); Wharton, 'Captain Cook's Journal During His First Voyage Round the World' (1897); Synge, 'Captain Cook's Voyages Round the World' (1897); Kitson, 'Captain James Cook' (1907).

COOK, John, Canadian clergyman and educator: b. Sanquhar, Scotland, 1805; d. Kingston, Ontario 1892. He was educated at Edinburgh University, was ordained to the Presbyterian ministry in 1835, and came to Canada in 1836, settling at Quebec. He aided in founding Queen's University, Kingston, and was acting principal there in 1857-60 and first chancellor 1877-80. He was also one of the founders of Morvin College, Quebec, in 1862; and became its first principal. He actively supported Presbyterian union in Canada and in 1875 was the moderator of the first general assembly.

COOK, John Francis, American negro educator: b. about 1785; d. Washington, D. C., 1855. In 1834 he became head of the Columbian Institute, a free school for negro children. Cook stands forth the most conspicuous figure of his race during the first half of the 19th century. His leadership was manifested both in religious matters and in secular affairs. He was one of the organizers of Union Bethel Church in 1838; was organizer and first pastor in 1841 of the Fifteenth Street Presbyterian Church; was one of the charter members of United Friendship Lodge of Odd Fellows. At his death the mantle of education fell to his two sons, who had gained their experience as his assistants at the Columbian Institute.

COOK, John Francis, American negro educator and civil administrator: b. Washington, D. C., 21 Sept. 1833; d. 1910. His early years were spent without special incident. After teaching for some years in the school established by his father, John Francis Cook, Sr. (q.v.), he taught for a brief period in New Orleans and until the outbreak of the Civil War. In 1867 he accepted a clerkship in the office of the collector of taxes in his native city. The next year he became a member of the board of aldermen and in 1868 was elected register of the city. In 1874 he was nominated to the collectorship of taxes by President Grant and confirmed by the Senate, a position held by him through the administrations of Grant, Hayes, Garfield and Arthur, until the accession of the Democratic party caused his resignation. In 1906 he was appointed a member of the local board of education. He also served as trustee of Howard University for 35 years.

COOK, Joseph, American lecturer and author: b. Ticonderoga, N. Y., 26 Jan. 1838; d. there, 24 June 1901. He was graduated at Harvard and Andover Theological Seminary, and after three years' preaching went to Europe in 1871, where he studied in Germany, and made a tour of the Mediterranean countries. In 1873 he began a series of «Monday Lectures» in Boston, which, endeavoring to harmonize science and religion, and discussing social and political questions, became very popular; in 1880 he began an extended lecturing tour around the world. In 1883 he returned to Boston and resumed his Monday lectures. In 1888 he founded a religious monthly called *Our Day*. Besides his lectures, he published a number of works on such subjects as 'Biology' (1877); 'Transcendentalism' (1877); 'Marriage' (1878); 'Heredity' (1879); 'Labor' (1880); 'Socialism' (1880); 'Occident' (1884); 'Orient' (1886); 'The Higher Levels of Arbitration' (1900); 'New Defenses of the Lord's Day' (1900).

COOK, Melville Thurston, American botanist: b. Coffeen, Ill., 20 Sept. 1869. He was educated at De Pauw and Leland Stanford Junior universities, and took post-graduate work at the universities of Chicago and Ohio. In 1894-95 he was principal of the Vandalia (Ill.) high school, in 1895-97 instructor, and in 1897-1904 professor of biology at De Pauw University. He was chief of the department of plant pathology and economic entomology at the Estación Central Agronómica, Santiago de las Vegas, Cuba, in 1904-06, and plant pathologist at the Delaware agricultural experiment station, Newark, N. J., 1907-11, and since the latter year has been professor of plant pathology at Rutgers College and State plant pathologist of New Jersey. He has published 'Diseases of Tropical Plants' (1902), and many contributions to botanical journals.

COOK, Orator Fuller, American botanist: b. Clyde, N. Y., 28 May 1867. He was educated at Syracuse University, where he was in charge of the biology department in 1890-91. As agent of the New York Colonization Society he made explorations and investigations in Liberia in 1891-97, and he also served as professor of natural sciences in Liberia College during this same period and as president of the institution in 1896-97. In 1898 he became custodian and assistant curator of the United States National Museum. He had charge of plant importation by the United States Department of Agriculture from 1898 to 1900, when he took up the investigation of tropical agriculture. In 1904 he became professor of botany at George Washington University. In 1915 he accompanied the Bingham expedition to Peru and investigated the plants used by the Incas. He is author of various articles and reports on Liberia and African colonization, Porto Rico, tropical agriculture, botany, zoology and evolution.

COOK, Stanley Arthur, English Orientalist: b. King's Lynn, 12 April 1873. He was educated at Gonville and Caius College, Cambridge, of which he became fellow and lecturer in Hebrew and Syriac. In 1896-1903 he was on the editorial staff of the 'Encyclopædia Biblica'; in 1902 he became editor for the Palestine Exploration Fund; and he was the editorial adviser and a contributor on Old Testament and Semitic subjects to the 'Encyclopædia Britannica.' He contributed to the *Jewish Quarterly*, the *Expositor*, etc., and published 'Glossary of Aramaic Inscriptions' (1898); 'The Laws of Moses and the Code of Hammurabi' (1903); 'Critical Notes on Old Testament History' (1907); 'Religion of Ancient Palestine' (1908); 'I Esdras' (1912); 'The Study of Religions' (1914).

COOK, Theodore Andrea, English journalist and author: b. Exmouth, Devonshire, 28 May 1867. He was educated at Wadham College, Oxford, and was on the editorial staff of the *Saint James's Gazette,* 1897–1900, and has been editor-in-chief of *The Field* since 1910. He has published 'Old Touraine'; 'Rouen' in 'Mediæval Towns Series'; 'Tobogganing at Saint Moritz'; 'A History of the English Turf'; 'An Anthology of Humorous Verse'; 'The Spiral in Nature and Art'; 'Turner's Water-Colors in the National Gallery'; 'Old Provence'; 'Twenty-five Great Houses of France'; 'The Germans by Themselves'; 'Kultur and Catastrophe'; etc.

COOK, Thomas, English excursion promoter: b. Melbourne, Derbyshire, 22 Nov. 1808; d. 19 July 1892. In the earlier portion of his career he was prominently identified with the temperance cause. Later he devoted himself to the work for which he became famous. On 5 July 1841 he began an excursion train between Leicester and Loughborough on the Midland Railway, England. This was the first publicly advertised excursion train in England. From this small beginning the enormous business of Thomas Cook & Son, Managers of Tours and Excursions (known as "Cook's Excursions") was subsequently evolved. To John Mason Cook, son of the founder (b. January 1834; d. 4 March 1899), the present scope of the business is mainly due. The existing firm is composed of the three grandsons of the founder. To such an extent has the "Cook's Excursion" business developed that the company now has agencies all over the globe, the head office for the United States being in New York.

COOK, Walter, American architect: b. New York, 23 July 1846. He was educated at Harvard University and received his professional training at the Royal Polytechnic School, Munich, and the École des Beaux-Arts, Paris. In 1877 he returned to New York, becoming in succession a member of the firm of Babb, Cook and Willard; Babb, Cook and Welch; and Cook and Welch. He was a member of the jury for the New York Public Library and for the University of California, became consulting architect for the board of estimate and apportionment, New York, and was a member of the New York art commission 1905–07. Among the buildings designed wholly or in part by him are the DeVinne Press building, office buildings for the New York Life Insurance Company, a residence for Andrew Carnegie, the Choir School at the cathedral of Saint John the Divine, the stadium and other buildings at the Pan-American Exposition, and a number of branch buildings for the New York Public Library. He is a member of the National Academy of Design and chevalier of the Legion of Honor.

COOK, William Wilson, American lawyer: b. Hillsdale, Mich., 16 April 1858. He was graduated at the University of Michigan 1880, and from its law department in 1882. He is general counsel for the Postal Telegraph Cable Company, the Commercial Cable Company and the Commercial Pacific Cable Company. He has written 'Treatise on the Law of Stock and Stockholders as Applicable to Railroad, Banking, Insurance, etc., Corporations' (1887); 'Trusts: Their Character, Legality and Mode of Organization' (2d ed., 1888).

COOK, Mount, the highest peak of Australasia; is one of the southern Alps near the centre of the range, on the west side of the South Island of New Zealand. It is 12,349 feet high, is covered with perpetual snow (the snowline being 3,500 feet lower than in Switzerland), is difficult of access, and was scaled for the first time by the Rev. W. S. Green on 2 March 1882.

COOK INLET, Alaska, bay of the north Pacific Ocean, between the Alaskan and Kenai peninsulas, in lat. 59° and 61° 20′ N. and long. 149° and 154° W. In shape long, narrow and crooked, its length is about 200 miles and its greatest breadth 60 miles. Sudden storms, fogs and tidal rips, due to high tides along the broken coast line, make navigation at the northern extremity somewhat dangerous. From November to May the northern part is locked in ice. It contains several islands, Augustine Island, with its volcano, Mount Saint Augustine, in violent eruption during 1883, being the largest. The coast scenery is grand, comprising active volcanoes, snow-clad mountains, glaciers and green hills. It was explored in 1778 by the navigator whose name it bears, in the hope of finding a passage to the Arctic Sea. It receives the waters of a number of rivers, chief of which is the Sushitna River, coming from the north. Coal is found on its shores, along which are a number of small towns. Seldovia is the port of call for steamships.

COOK ISLANDS, New Zealand, archipelago of small islands in Polynesia, consisting of the islands of Raratonga, Mangaia, Atiu, Aitutaki, Mauke, Mitiaro and the Hervey group. They lie between 8° and 23° S. lat., 157° and 170° W. long. The total area is about 150 square miles. The soil is generally fertile but water is scarce. The chief products are copra, coffee, pearl-shell, fruit, hats and caps and lime-juice. The trade for 1914 was imports $511,160, including $336,095 from New Zealand; exports $435,075, including $350,380 to New Zealand. The inhabitants are Polynesians of the Tongafiti migration, and are all converts to Christianity. The islands were discovered by James Cook in 1773–77; became a British protectorate in 1888, and in 1901 were annexed to the Dominion of New Zealand, with which there is monthly steam communication. Laws have been made since 1890 by a general legislature, and are administered by an executive council of which the Arikis, or native chiefs, are members. At Raratonga there is a British resident, whose approval is required for all enactments. The annual death-rate is higher than the birth-rate of the islands. Pop. 6,964.

COOK STRAIT, New Zealand, passage which separates North Island and South Island. Its greatest width is 90 miles. It was discovered by Captain Cook on his first voyage in 1769.

COOKE, George Frederick, English actor: b. Westminster, 17 April 1756; d. New York, 26 Feb. 1811. He made his first public appearance at Brentford in 1776; and in the period between 1784 and 1800 became very popular in the English provinces and in Ireland, attaining a front rank in his profession. From 1801 to 1810 he played at Covent Garden both in comedy and in tragedy, and rivaled Kemble in the public favor. His best characters were Richard, Shylock, Iago, Sir Giles Overreach and Sir Pertinax MacSycophant. In 1810 he visited the United States and appeared before enthusiastic audiences in the chief cities. A monument marks his grave in Saint Paul's churchyard in New York city, erected in 1821 by Edmund Kean, who regarded Cooke as the greatest of actors. Consult Dunlap, ‘Memoirs of Cooke’ (London 1813).

COOKE, George Willis, American Unitarian clergyman and author: b. Comstock, Mich., 23 April 1848. He was educated at Olivet College, Michigan, studied for the Unitarian ministry at Meadville Theological School, and was ordained in 1872. He has since held Unitarian pastorates in Wisconsin, Michigan, Indiana and Massachusetts. After 1899 he devoted his time principally to lecturing and writing. Besides contributing much to the periodical press, including editorials to the *Christian Socialist* (he became a Socialist in 1902), he has published ‘Ralph Waldo Emerson, his Life and Writings’ (1881); ‘Life of George Eliot’ (1883); ‘Poets and Problems’; ‘The Clapboard Trees Parish, Dedham: a History’ (1887); ‘A Guide Book to the Poetic and Dramatic Works of Robert Browning’ (1891); ‘The Spiritual Life’ (1893); ‘Biography of John Sullivan Dwight’ (1898); ‘History of Unitarianism in America’ (1903); Notes to the Riverside edition of the Works of Robert Browning (1899); ‘An Historical and Biographical Introduction to The Dial’ (1902); ‘The Poets of Transcendentalism’ (1902); ‘Bibliographies of Lowell and Emerson’ (1907); ‘Woman in the Progress of Civilization’ (1909); editor three volumes of Theodore Parker's Complete Works (1910).

COOKE, Grace MacGowan, American novelist: b. Grand Rapids, Ohio, 11 Sept. 1863. In 1897–98 she was president of the Tennessee Woman's Press Club. Her publications include ‘Mistress Joy,’ with Annie Booth McKinney (1901); ‘Return: A Story of the Sea Islands,’ with Alice MacGowan (1903); ‘Huldah’ (1904); ‘A Gourd Fiddle’ (1904); ‘The Grapple’ (1905); ‘Their First Formal Call’ (1906); ‘Son Riley Rabbit and Little Girl’ (1907); ‘The Power and the Glory’ (1910); ‘The Doings of the Dollivers’ (1910); ‘The Joy Bringer’ (1912); ‘William and Bill’ (1914); ‘Sonny Bunny Rabbit and His Friends’ (1915).

COOKE, Jay, American capitalist, known as the «Financier of the Rebellion»: b. Sandusky, Ohio, 10 Aug. 1821; d. Ogontz, Pa., 16 Feb. 1905. He was educated in private schools. At the age of 13 he had entered mercantile life as a clerk in a Sandusky store, there displaying unusual ability as a bookkeeper. In 1835 he went to Saint Louis to engage in mercantile business. In 1838 he entered the banking house of E. W. Clark & Company in Philadelphia, and so rapidly mastered the intricacies of finance that before he became of age he was given power of attorney for the firm. Upon his retirement from that firm he was engaged in a general banking business until 1861, when he united with his brother-in-law under the name of Jay Cooke & Company. From 1861–65 his house acted as agent for the government in floating the Civil War bond issues to the extent of $2,500,000,000, including the 5–20 loan of $515,000,000 (February 1862), the 10–40 loan of $200,000,000 (March 1864), the 7–30 loan of $829,992,500 (June 1864 to March 1865), and others. These services he rendered to the nation for so small a commission there was practically no profit. A long period of successful operations followed the war, and then the firm became fiscal agents of the Northern Pacific Railway Company, advancing large sums of money on its bonds, but in the financial panic of 1873, being unable to realize a sufficient amount on the bonds to tide them over the trouble, on 18 September suspended business and eventually went into bankruptcy. The value of the bonds afterward greatly increased. Mr. Cooke not only regained his fortune, but paid his creditors both principal and interest, and the firm continued successfully. Consult Oberholtzer, E. P., ‘Jay Cooke, Financier of the Civil War’ (Philadelphia 1908).

COOKE, Joseph Parsons, American chemist: b. Boston, 1827; d. 1904. He was graduated at Harvard in 1844, and soon afterward was appointed to the chair of chemistry and mineralogy there. In this capacity he stimulated the study of chemistry at collegiate institutions, urging laboratory instruction, which before his time had not been introduced into the undergraduate course of American colleges. He introduced his pupil Theodore William Richards to the study of atomic weights — a subject to which the latter made many signal contributions. The joint communication, by Cooke and Richards, on the relative values of the atomic weights of hydrogen and oxygen, was published in the ‘Proceedings of the American Academy of Arts and Sciences’ for 1887. Cooke's other publications include ‘Chemical Problems and Reactions’ (1853); ‘Elements of Chemical Physics’ (1860; 4th ed., 1886); ‘First Principles of Chemical Philosophy’ (1868; rev. ed., 1882); ‘The New Chemistry’ (1872, 1884); ‘Michigan: a History of Governments’ (1885; rev. ed., 1905); ‘The Credentials of Science the Warrant of Faith’ (1888).

COOKE, Mordecai Cubitt, English botanist: b. Horning, Norfolk, 1825; d. 1912. When a boy he was successively a draper's assistant, clerk in a law office and later a school teacher. He secured a position in the Indian Museum in 1860, and was transferred thence to the Kew Botanical Gardens in 1880. In 1903 he was awarded the Victoria medal of honor by the Royal Horticultural Society, and the Linnæan gold medal by the Linnæan Society. He published over 40 volumes, several of which deal with fungi, including ‘Manual of Botanic Terms’ (1862); ‘Handbook of British Fungi’ (1874); ‘Mycographia’ (6 vols., 1879); ‘Illustrations of British Fungi’ (8 vols., 1881); ‘Introduction to the Study of Fungi’ (1895); ‘Mushrooms, Edible and Poisonous’ (1903); ‘Fungoid Pests of the Flower Gardens’ (1906); ‘Manual of Structural Botany’ (1907).

COOKE, Philip Saint George, American military officer: b. near Leesburg, Va., 13 June 1809; d. Detroit, Mich., 20 March 1895. He was graduated at West Point in 1827 and rose to the rank of brigadier-general. He was on the frontier for several years, and took part in the Black Hawk War of 1832. In the Mexican War he was in California in command of a battalion of Missouri volunteers and later commanded a regiment in the city of Mexico. After 1849 he was again on the frontier, took part in several expeditions against the Indians, commanded the Utah expedition of 1857–58 and was commander of the Department of Utah in 1860–61. In the Civil War he sided with the Union and greatly distinguished himself in the Peninsular campaign. He was brevetted major-general at the close of the war, commanded the Department of the Platte in 1866–67, the Department of the Cumberland in 1869–70, and the Department of the Lakes, 1870–73, when he retired. He was the author of works on tactics and of ‘Scenes and Adventures in the Army’ (1856); ‘Conquest of New Mexico and California’ (1878); ‘New Cavalry Tactics’ (1884).

COOKE, Richard Joseph, American Methodist Episcopal bishop: b. New York, 31 Jan. 1853. He was graduated at East Tennessee Wesleyan University in 1880. He entered the ministry in 1873, became professor of New Testament exegesis and historical theology in Grant University, with which institution he was connected until 1912. From 1891 to 1912 he was editor of the *Methodist Advocate Journal,* and book editor of the Methodist Episcopal Church. In 1912 he was chosen bishop of the Church. He was fraternal delegate from the Methodist Episcopal Church to the British and Irish Wesleyan conference, England and Ireland 1906. He has published ‘Doctrine of the Resurrection’ (1884); ‘Reasons for Church Creed’ (1888); ‘Christianity and Childhood’ (1891); ‘The Historic Episcopate’ (1896); ‘History of Ritual of M. E. Church’ (1900); ‘Christ and the Critics’ (1898); ‘Digest of Judicial Decisions of the General Conference of the M. E. Church’; ‘Incarnation and Recent Criticism’ (1907); ‘Freedom of Thought in Religious Teachings’ (1913) and contributions to religious periodicals.

COOKE, Rose (Terry), American poet and story writer: b. West Hartford, Conn., 17 Feb. 1827; d. Pittsfield, Mass., 18 July 1892. She married Rollin H. Cooke in 1873. Her complete poems were published in 1888, ‘The Two Villages’ being her best known poem. Her short stories treat of New England rural life, her most acceptable work appearing originally in the *Atlantic Monthly* and other periodicals. Her published books include ‘Poems’ (1860); ‘Happy Dodd’ (1878); ‘Somebody's Neighbors’ (1881); ‘The Sphinx's Children and Other People's’ (1886); Complete Poems’ (1888); ‘Steadfast,’ a novel (1889); ‘Huckleberries,’ a collection of short stories (1891).

COOKE, Sir William Fothergill, English electrician: b. Ealing, Middlesex, 1806; d. 25 June 1879. He served in the Indian army from 1826 to 1831; and, after studying medicine at Paris and Heidelberg, abandoned this for telegraphy, and in 1837 entered into partnership with Professor Wheatstone. After experiments on various railway lines, they patented the single needle apparatus in 1845. A dispute then ensued between the partners as to the part played by each in the achievement. In 1846 Cooke formed a company, which paid $600,000 for the partners' earlier patents. Wheatstone was knighted in 1868 and Cooke in 1869.

COOKERY, the art of preparing food for eating. The savage does little or no cooking; he lives on roots, fruits, insects and raw flesh, and when he cannot procure food, he twists his belt tighter and tighter; the barbarian makes a fire and hunts and fishes, but still eats much of his food raw, or with the slight disintegration of fibre given it by the motion of his body as he carries the food on his steed. Neither cares he for variety, nor has any purpose in eating other than to satisfy hunger. With the development of agriculture came an increase in food supplies, in the use of fire in cooking and an advance in civilization; and with the development in man's social nature, eating ceased to be a mere grabbing game, and food was shared with friends,— and strangers also, for there were no public inns,— as an evidence of good will. Later, feasting was a part of all hospitality, and banquets in honor of the gods, of victory, or some special event, came to be considered the highest form of social physical enjoyment. As the ancients in times of prosperity sought the rarest foods (500 nightingales' tongues were often made into one pie), and served them in the most costly manner (whole cities being ruined, it is said, where Xerxes was entertained for two meals), so history repeats itself, and some modern hosts spare no labor or expense in setting before their guests the most unique concoction their chef can prepare, as the highest expression of good will. But they often have no concern as to the nutritive effect of their offering. The thoughtful person feels that extravagant cooking and riotous feasting are not necessary to true hospitality, nor to the genuine enjoyment of food. He has learned that the true reasons for cooking food are:

First, to have the time and energy needed to digest and assimilate unprepared food, to use in getting a living while developing his mental and moral nature.

Second, to facilitate mastication and digestion, by softening hard and tough substances, changing starch into dextrin, sugar into caramel and connective tissue into gelatin, developing improved flavors and odors, and having at least a part of the food warm.

Third, to destroy parasites and disease germs.

Fourth, to keep foods which are perishable that he may enjoy them when out of season.

The cooking of food includes several important processes, not always considered, some of which call for the highest degree of intelligence; but too often cooking is regarded merely as a form of manual labor. Taking these in their natural order we have:

Selection.— This was once a question of mere environment; food nearest at hand being the «Hobson's choice» of the savage, as it now is of the very poor in many lands. Climate and non-intercourse with other nations limit choice, as invasion, travel and increased trading facilities extend it. From the limited, but not always scanty fare of the Pilgrims, to the cosmopolitan markets of the present day, is a wonderful advance, and the modern American often yields unwisely to their temptations. Appetite guides us safely in this choice of material, when it has not been impaired by too great indulgence in improper food. To select from this vast supply, food sound in texture, free from adulteration, seasonable, not exorbitant in price, adopted to individual need, and suitable in quantity, needs no small amount of judgment in the buyer, who often must also be the cook.

Separation.— The removal of the inedible from the edible portions of food is important, for the thoroughness with which it is done has much to do with making food palatable. Perhaps in no other part of the work has there been greater improvement over the primitive methods, as man's idea of what is inedible takes him farther and farther away from the savage, some of whose methods are too repulsive to bear allusion. Our forbears were entertained before the feast by the slaughtering of animals in their presence, but now the refined taste is offended by the sight of a fowl dressed for the table in his discarded feathers; or a bit of hull in a supposed-to-be coreless apple, or food served in inedible scooped-out skins.

Combination.— The union of various materials often produces a more palatable food than any one would give alone. Association, custom and appetite have much to do with deciding whether certain combinations are harmonious or otherwise. Saffron, tansy, asafetida, decayed fish powder and hosts of other strange flavorings do not appeal to us, although highly prized by other nations. Pies, supposed to be filled with delectable compounds, but out of which dwarfs sprang and danced, and blackbirds sang, pleased our ancestors; and surprise is still a pleasant element in cookery. But it is not pleasant to find the biscuit which was supposed to be sweet with the nutty flavor of the wheat redolent with alkali.

Literature is replete with legends of the accidental discovery of the improved flavor found in a bit of the forbidden flesh on the altar, of fish rescued from burning seaweed, of bread made lighter with a portion of left-over dough, and many others which led to new ways of preparing food. The most fanciful legend seems credible when we remember the many times in one's own experience when accident or necessity has led to new combinations. Scientific proportion, correct measurement, thorough mixing and sufficient judgment to allow for the «total depravity of inanimate things» are needed to ensure uniform results. So to blend materials that they will develop «what ingenious cooks the relish call» is the fundamental principle of cookery, for «all foods are tasteless till that makes them good.» It is the undesirable combinations of the odors from the different foods in the ovens and kitchens of many hotels and restaurants that makes the unsatisfied boarder long for home cooking.

The Belgians, Swiss and Austrians are said to have best acquired the art of retaining in a high degree in each food its full essence, aroma and properties, so that each dish has no odor or flavor from another. It is said one of the Roman epicures had a separate cook and separate kitchen for each dish.

Too much time and thought are given to the making of new combinations merely to gratify the desire to excel one's neighbors in one's luncheon. This causes great nervous strain and physical fatigue, and imposes upon the guests a deal of unnecessary work for their digestive organs in the undoing of these combinations.

Manipulation.— For the manual part of cookery, tools and utensils are needed, which if wisely selected will not oblige one to say with Telemachus,

> Lend me, I pray you, the sauce pans
> In which you boiled your beans.— *Timocles.*

That cook is fortunate who has the strength and endurance needed for the back-and arm-aching parts of the work, and still more fortunate if she possesses the deftness of hand and keen sense perception of the culinary artist; for we cook by the senses of touch, smell and hearing, as truly as by sight and taste. And those for whom she cooks are happy indeed if she knows how to apply heat (see ***Methods***) in the way that food will yield the greatest amount of nutriment in the shape best fitted for the body to assimilate it, as otherwise much food will be wasted in the cooking and wasted in the body.

Decoration.— This is the last step in the manual part of cookery, but an important one, for «the imagination should be fed when we feed the body, they should both sit at the same table.» Those who labor with the larger muscles are usually sufficiently hungry to eat whatever is clean and wholesome; but the non-hungry person, or one who works with the small muscles of the hands or eyes, needs the stimulus which the senses of sight, smell and taste send to the stomach, to arouse his sense of hunger. This class of persons increases as civilization advances. There are some foods which if one ate them blindfolded would satisfy the mouth and the stomach would not demur. The nose rebels at Camembert, but the mouth approves. The eye should not be pleased and the tongue offended, but all these «gate tenders of the stomach» should agree in approval, if we would derive the best effect from our food. The tendency of the modern cook to make superfluity of garnishing conceal both merit and defect in material is to be deplored. Simplicity in design, harmonious blending of color and material, enhancing rather than disguising the individuality of each dish, with the least expenditure of money and labor, are most to be desired, and make of this indeed a fine art.

> To take some meat that some one else has bought
> And then to dress it tolerably, is
> What any cook can do.
> A perfect cook is quite another thing,
> For there are many admirable arts,
> And of all of these he must be thorough master,
> Who would excel in this. He first must have
> A smattering of painting and indeed
> Many the sciences which he must learn
> Before he's fit to think of cookery.— *Nichomachus.*

Cookery as a Science.— But little thought was given to this aspect of cookery by the ancients; probably more among the Greeks than among other nations, for the Greeks worshipped Hygeia, the goddess of health, and lived on coarse foods, barley bread, oil and wine. Wheat was called the “marrow of man” and “running, fatigue, hunger and thirst” were their seasonings. Cookery attained a high degree of development during the Attic Age. The following quotations show that the Greeks understood the qualifications of a cook, and the effect of heat and water on food; and the third hints that our kitchen maids of to-day were not the first cooks who hurried up the fire with oil.

> His mind must comprehend all facts and circumstances;
> Where is the place and what the time for supper;
> Who are the guests and who the entertainer;
> What fish to buy and where to buy it.—*Athenæus.*

> Fish that are fat are pleasant to the palate, but heavy and difficult of digestion, therefore they are better cured or roasted, for by that process their fatty parts are got rid of. Oysters when boiled get rid of most of their saltness which they infuse into the water which boils them, and this water is apt to disorder the stomach; but roasted oysters have all their evil properties removed by the fire.—*Mnesithus.*
>
> Placing all my pans upon the fire, I soaked the ashes well with oil, to raise a rapid heat.—*Archedius.*

The cook held the life and honor of his master in his hands, so common was poisoning by food; honors and wealth were bestowed upon those who had ability, those from Sicily ranking highest.

It was not until chemistry had advanced to the position of an exact science, and had evolved methods of analysis for organic substances, that the nature of food constituents, the changes in the nutritive value of food brought about by cooking, and what becomes of food in the body, could be determined.

Although vast strides have been made since Count Rumford, an American, who lived in Europe the latter part of the 18th century, taught the world how to cook and was the first to note the changes in the nutritive value of food on a large scale, the insight and method of the scientist,— the science of cookery is yet in its infancy.

The Agricultural Department in Washington has done a fine work along the lines of scientific analysis and experiment in food values, and its bulletins, issued frequently and free to any one on application, supply the latest and most reliable information. Investigations have also been made by many of the most civilized nations into the best way of preparing food for the army and the inmates of prisons and hospitals. Chefs gain their knowledge of the art of cookery by apprenticeship to noted chefs, taking a long and thorough training in every branch of the work. Training in the home, by “mother's way,” is all the teaching many skilful housekeepers have received, but this, combined with judgment and faculty, has produced much good work.

During the last half of the 19th century, schools for instruction in cookery were opened in England, the agricultural colleges of the West, New York, Boston and other large cities. Here not only the art, but the scientific principles were taught, and the pupils included children from the mission schools, servants, housekeepers, young and old, college and medical students and ladies of wealth and leisure. The first outgrowth of this beginning was the establishment of schools for training of teachers of cookery, and later cooking was made a part of the regular course in the public schools. Boston led in this part of the work, and now at the beginning of the 20th century, there are but few States in the Union and but few European countries where cooking schools are not found in successful operation.

Literature.— Cooking and feasting have been the theme of brush and pen, of song and romance in all countries, and from the earliest days of book-making, cookery has had quite a literature of its own. The names of Archestratus, Herodotus, Homer, Apicius, Lucullus and many others are associated in the minds of the student with the cookery and banquets of the Greeks and Romans. To attempt to enumerate those who have helped in the development of modern Italian, French and English cookery would be to do injustice to many of whom limited space would prevent mention. If one were to ask for the catalogue of culinary literature in any large public library in America, it would be found to be quite a volume, so rapidly has the literature of cookery multiplied, since it has taken front rank among the arts and sciences.

It has been claimed that men are the only really good cooks, chiefly because they make it their business for life and strive to excel in the art, whereas women adopt it only as a means of support until marriage relieves them from its necessity. And Dr. Johnson said that “women could not write good cook books.” Perhaps men are better fitted to be chefs in hotels and large establishments, and to work with and manage a great body of men, and from having no other duties they have had ample time and means to give the subject more study. But when we recall the many women who have always prepared good, wholesome (if not fancy) food for their large families,— those who have catered to institutions, and those who have done fine work in teaching the science of cookery in schools and by their books and lectures, we question the statement. The American cook book of the 20th century is not a mere compilation of untried and inaccurate recipes, it is not a record of only one person's experience, where much is left to judgment, nor of a style of living too extravagant for the average home; but it is an evolution from the best experience of all nations, a collection of exact formulæ deduced from actual experiment, giving the results of the latest scientific research, and all presented in an entertaining way in the best literary style.

Evolution.— The evolution of cookery, as traced in food, would be something after this order: The first foods were natural; milk, wild fruits, and vegetables, flesh and fish, eggs and animal fats, honey and salt, oily seeds and beverages made from simple fermentation of fruit-juices and of milk. The second stage might be called one of cultivated and manufactured or combined foods: the cereals, grains and legumes were developed into bread, cakes, puddings and malted drinks, milk into butter and cheese; intercourse with other nations brought a great variety of vegetables, fruits, condiments and beverages. The present stage is one of refined foods. The refinement of flour and yeast, the concentration of the sapid principle in meat and its use in soups and sauces, the refinement of fruit and vegetable juices into sugar, and its increased use in fancy cakes, pastry, desserts and artistic confectionery, are typical of the most advanced and refined forms of cookery.

In tracing the evolution of cookery among different nations, we find it has had the customary rise and fall of all the arts; increasing in variety, magnitude and indulgence with the growth and prosperity of each nation; its national characteristics always largely determined by climate and natural advantages, but varied by invasion, intermarriage of rulers and nobility, and the advance of civilization. Persia with her fruits, sweets, wines and her lavish display modified the simplicity of the Greeks; the luxury and extravagance of the Romans disappeared under the invasion of the Goths, who cared only for wild fruits, fowl, venison, horseflesh and curdled milk. During the Middle Ages the best cooking was done in the monasteries. They had ample means and their many fast days incited them to the invention of many disguises. In Italy during the Renaissance, cookery, with the other arts, became more refined, and France soon felt the influence, through the Medici. She had early learned economy through necessity from famine and the exactions of her rulers; her many revolutions compelled every peasant to learn to make something savory of weeds, acorns, snails, rats and other things which many nations reject. Modern French cookery dates from Louis XIV and attained great height under his successors. The nobility and even royalty spent much time concocting new dishes; Richelieu made mayonnaise, and Bechamel the sauce bearing his name. The French made great use of meat essence as a dressing for meats, and it was considered a great improvement over the oil of the south and the animal fats of the north. Large amounts of meat, poultry and game were often used solely to secure a small amount of glaze with which to dress an entrée; this shows an extravagant as well as an economical side to French cookery. Under Napoleon French influence was widely extended and it is said he left a French chef in every land he invaded. There are more chefs from France in America than from any other country. Austria and Switzerland rank next to France in excellence of home cookery. England's love for pork began with the Saxon invasion, and though condemned by some of her colonists, it is yet the mainstay of her laboring classes. The coarse tastes of the Danes were modified by the soups and stews of the Normans. Many of our culinary terms are of Norman origin, and the surnames Cook and Butler came from professionals in that time. After groaning for centuries under saddles and sirloins, England's tables became more simple, for after the Reformation rich cooking was considered popish. Although modified by the modern French, England is still the great meat-eating nation. "The English do their culinary work at the table with their palate-scorching table sauces, but the French do theirs in their saucepans." Scotland with her barren hills lacked vegetables, but mutton, game and fish were abundant; her cock-a-leekie and haggis show the influence of France.

There are still a few distinctly American dishes, many of them borrowed from the Indians, some made from native products, but a large number are but modifications of the customs in the homes of the earliest settlers. The Yankee's love for pie may be traced to the mother country, and for the doughnut to Holland. The Dutch left a strong impress on New York and the Germans in the middle States. Extravagance in methods, great waste of fuel and material and the indigestibility of some of our national dishes have been our defects, but a large part of genuine American cookery will compare favorably with that of other nations. Within the last half century travel and wealth have changed our tastes in a measure, enabling many to have chefs from abroad who command very high salaries. We have gained much of value from China and Japan. France has done more than any other nation in teaching us economy and artistic effect, and the influence of Spain is apparent on our western coast and our new possessions. The advantage of this influx of foreign elements into our cuisine has been greatest in cities and among traveled classes. In remote country places and everywhere among native laboring communities, there is need of knowledge of some of the economical foreign methods. Cooking teachers find it wise to accept some of the suggestions from their pupils of German and Italian parentage, instead of insisting that our methods are always the best. No doubt many foreign nations would derive equal benefit and enjoyment from some of our dishes which are seldom seen there. Canvasback ducks, softshell crabs, strawberry shortcake, fish balls, pumpkin pie, prairie chicken, red-snapper, cranberries and oyster in many ways are eagerly welcomed by the returning traveler.

The cultivated American of colonial descent, while loyal to the virtues of succotash and the four B's of Boston, which are similar in nature and food value to the tortilla and frijoles of Mexico and the lentils of Egypt, is learning what to accept and what to reject from the solid puddings, pastry, bread and meats of England; the spicy cakes, sour vegetables, sausages and delicatessen supplies of Germany; the complex soups, sauces, entrées, soufflés and artistic disguises of the French; the pungent Spanish puchera; the savory Hungarian goulash and Turkish pilaf; the Italian palenta, risotto and macaroni; the hors d'œuvres of Russia and Scandinavia, and the curries and fruits of the tropics; and from them all he is beginning to evolve a simplicity and an individuality which may be characterized as truly American. He prefers on his meat the sauce of its own juices; he insists on having no doubt as to the identity of his veal and chicken; he has accepted the piquancy of the green salad with its soothing oil in place of the sweets of the pudding and the sharpness of his mother's pickles. The nutty Vienna roll has taken the place of the half-baked raised biscuit, and he finds the bit of cheese which is the main food of the Swiss or Holland peasant, with the fruits and nuts of the savage, a good substitute for the soggy pie of his aristocratic ancestor.

Evolution of Methods of Cookery.— It is sufficient for our purpose here to consider foods merely as animal and vegetable, with albumen as the type of the former, and starch of the latter, albumen requiring a low and starch a high temperature. (See FOOD). Starch and albumen are frequently combined in natural food, and still more frequently in cooked food, but they must be digested by fluids of a different nature, one an alkaline and the other an acid. Therefore, how to cook them that each may best do its work in the body is the problem of good cookery.

Heat.— Cooking means, to prepare by heat (Latin *coquo*), and in all its phases heat is the important factor. The heat of the sun causes plant food to grow and ripen; the heat of the living animal prepares its flesh and products for the higher animal, man; he applies artificial heat in cooking vegetable and animal foods, and after eating them, his own internal heat helps in the assimilation of the food into his body. The absence of heat sufficient to be called *cold* is essential to make many foods more palatable. Water is removed from some foods by concentration, and added to others for the solution of albumen and the hydration of starch. Air, for the expansion of various substances the development of improved flavors and the dissipation of disagreeable odors is essential, and care should be taken that it be pure as possible.

Fuel.— Heat for cooking purposes was obtained first by drying foods in the sun. Many kinds of flesh, fish and fruit are still prepared in this way. Then came the burning of wood, oil, coal, gas, coal oil and alcohol; the latest advance is the use of electricity, the expense of which has retarded its adoption, but its merits are great and its possibilities unlimited.

Heat is applied to food in two ways: through hot air, as in broiling, roasting and baking; and through hot liquids, as in boiling, frying and their variations.

Broiling or *Grilling* is cooking by close contact with the fire. The primitive way was on the coals: the smoke and ashes may have led the barbarian to wind the meat round a stick and hold it over the fire, much as the Turks do now with their strips of mutton or kabobs. To save personal attention the meat was suspended from a stick; later it was cooked on bars of wood or iron, called a gridiron, hence our word grilling, and was turned when partly cooked. The modern improvement of this time-honored method is the wire broiler, used over red-hot charcoal, or under the gas flame, and frequent turning has been found to be the secret of good broiling. Contact with the fire sears the fibres, with a slight loss of outside substance, but it seals the juices inside and gives the richest possible flavor. «The gridiron is the thermometer of civilization.» *Toasting* is simply the broiling of bread and other cooked starchy foods, in order to develop dextrin. It sometimes develops charcoal. *Pan-broiling* is cooking in a very hot dry pan, with sometimes the merest film of grease to prevent too great loss of substance by adhesion. The quick searing gives almost the same flavor as in direct broiling. It is a convenient way for the chafing dish and oil stove.

Put the anchovies in the heated pan and in a moment
They will begin to hiss and are done.— *Archestratus.*

Roasting is a modification of broiling, at a lower temperature, adapted to large pieces of meat and poultry, which, on account of their thickness, are placed at a greater distance from the fire after the first searing. In early times the animal was dressed and hung at once over the fire; when the fire was made in a hole, sticks were laid across on which the animal rested; we call it a barbecue. After fires were built on the hearthstones and cooking was done inside, the meat was hung on a frame placed in front of the fire, and was turned and basted by the cook's attendants. This was the common way of cooking meat in the great baronial halls of England for many centuries and may still be seen in old country inns. The modern spit has its clock-work attachments, which turn the meat, dip up the gravy and pour it over at regular intervals. In warm countries but little roasting is done; and although once the only way in America, it is now seldom used except in hotels, and by those who have ranges with a special attachment for roasting, or who have revived the old custom on the hearth of their country kitchens; for there are many who still think the old Greek method greatly superior to the cooking of meat in the oven, which is commonly called roasting.

Many are the ways and many the recipes
For dressing a hare, but this is best of all.
To place before a set of hungry guests
A slice of roasted meat fresh from the spit,
Hot, seasoned only with plain simple salt,
Not too much done. And do not you be vexed
At seeing blood fresh trickling from the meat,
But eat it eagerly. All other ways
Are quite superfluous, such as when cooks pour
A lot of sticky, clammy sauce upon it.— *Archestratus.*

Baking is cooking by the heat radiating from a hot oven. The principle is the same as in roasting and broiling, namely, a quick searing of the outer surface for the sake of the flavor and to retain the juices, then a lower temperature that the heat may reach the centre without burning the outside. If the oven is not hot, or water is used at first, the juices are drawn into the pan, enriching the gravy at the expense of the meat. Flesh which has tough connective tissue, cartilage and bone should be cooked a long time, and needs the solvent action of water, after the first browning. Baking renders watery vegetables drier and more savory, develops new flavors in fruits and grains and changes some of the sugar in the crust of cake into caramel and the starch in the outside of bread into dextrin. Some forms of baking are so nearly allied to stewing that it is impossible to make a strict division, but there is a great difference in the flavor developed by the two methods. In baking, the temperature is the important point, varying from 212° to 400° for different articles. The oven thermometer is the evolution of the old-time «hand and try cake» methods. Baking was done first in the hot ashes, then in a hole in the ground — the primitive oven — where a fire was built on stones and after it had burned down to coals, food was laid in, either in clay pots, or wrapped in moist leaves, then covered with brush or leaves, and left to cook slowly for a long time. Bread-fruit in the South Sea Islands is baked in this way. Pounded and moistened grains made into a thin batter were spread on hot stones by a dextrous sweep of the hand, cooking almost instantly; this was the first bread; the process may be seen now among the Arizona Indians in making piki. Some one found it better to cover the oven permanently and have an opening at one end; this was the beginning of the brick oven.

At the hearth fires, a covered utensil to stand near or over the coals, and later the Dutch oven, answered for daily use; the great brick oven near the chimney soon followed, and here enough «rye and injun» bread, pies, cookies, Indian meal pudding, and beans, were baked to last a large family through the week.

The kitchen range is an evolution of an American invention about the beginning of the 19th century. In many European countries they still use tile and brick stoves without ovens, all of the baking being done outside the home. In America there are ovens of every size and kind, from the tiny tin box for the gas burner or oil stove, the jacketed box of the Aladdin oven, which concentrates and utilizes all the heat from an oil lamp, the ventilated ovens of the coal and gas ranges; to the immense ovens of the large baking establishments, with their steam jets, revolving shelves and griddles and other contrivances for securing the right temperature and texture.

Frying is immersion in hot fat: from 345° to 400°. This is not boiling fat, as it is often called; it is the water in the food, or the fat, if new, which bubbles. Immersion implies depth enough to cover the articles, that the surface may be hardened before the fat can penetrate the food. A coating of egg and crumbs helps a moist surface to harden quickly and keep its shape. Some previously cooked foods are fried merely for the flavor and crispness of the crust. Frying has been called the «curse of American cookery,» but it is the wrong use of it that merits condemnation. Tough meat and flour mixtures rank with soda, put into cold lard and left to stew and sizzle until hard and soaked with burned grease, have been all too frequently a large part of the daily food on many American tables. It may have originated when it was so much an undertaking to «fire up» the brick oven, and the drafts prevented the food in the Dutch oven from getting beyond the palest tint of brown. But there are indications that the boiler, the Scotch bowl, and the stew pan, are taking the place of the spider. When at its best frying is not to be recommended for those with weak digestion, its only merit being its quickness, but this is gained at the expense of time in the last stage of the work, digestion. But little frying would be done if everyone had to fry his food and inhale the odors. Frying probably originated where olive-oil was in common use, and oil is still the general frying medium in countries bordering on the Mediterranean. There it is usually done well, for vegetable oil may be heated with less acrid odor than from animal fats. When a pure vegetable oil without odor can be procured at reasonable rates in America, and when housekeepers are willing to believe that it is more economical to fry in a large amount of fat at high temperature and drain the fried food thoroughly, than to let a smaller amount of fat be absorbed by the food, frying will be greatly improved. *Sautéing* is a French term meaning «to toss,» or turn over. It is the common way to cook omelets, mushrooms and other foods which need merely to be browned on each side in a little fat, or stewed in hot butter and tossed about until cooked. *Griddle Baking,* sometimes called frying, is cooking on a hot griddle, with no fat, if of soapstone, and but little if of iron. The griddle is shallow and would not hold fat. For waffles and fancy wafers the griddle is double and revolves over the fire.

Boiling and *Simmering,* terms often applied to cooking in water, regardless of temperature, so long as it is on the fire. At the sea-level, water *simmers,* or bubbles gently below the surface at 185°, and *boils,* or bubbles all over the surface, at 212°. Density, weather and altitude vary the boiling temperature more or less, but it is easier to make some cooks understand this, than to convince them that water cannot be made any hotter after it once boils all over, at least not in the ordinary kettle. The scientifically trained cook knows that «just a smile at one side of the meat» will cook it perfectly, and some of the foreign peasants seem to have known it intuitively, but the average cook in our kitchens piles on the coal until the water «dances a jig,» and then wonders that her meat is stringy and tasteless. The first knows that if she wishes good broth or stock, she must cut the meat small, put it into cold water and let the juices soak out, then heat this water to the simmering point. But the average cook never can remember when to use hot, when to use boiling and when to use cold water. The educated cook knows that rapid boiling is advisable for the first 5 or 10 minutes, to seal the juices inside in boiled meat,— the thinner the meat the shorter the time — and also to cook the starch in grains and vegetables; and that after this, the water should only simmer else there will be great washing out of substance. She knows, too, that when particles of food are to be kept in motion, to prevent adhesion among themselves or to the kettle, as in cooking rice and macaroni, the rapid boiling may be continued that «the rice may dance about.» But to the average mind the cooking of food in water is probably more or less guesswork, judging by the results.

Stewing is only another form of simmering. In making a soup a large amount of water is used, and in making a stew a small amount. In both, the cooking is continued a long time at a gentle heat. Tough meats are improved in flavor by the union with vegetables, spices and other seasonings. In the soup they are removed, if it is to be clear, but in the stew they are retained. When dumplings of biscuit dough are cooked as a cover for the stew, or shortcake is served around the stew, it becomes a pot pie.

Fricasseeing, meaning «to fry,» is a combination of frying with stewing, by which a flavor like that in frying, or pan broiling, is obtained.

The term is sometimes used when no real browning is done, the simple warming, or stewing in butter at a low temperature, making it, according to some authorities, a fricassee. It is to be regretted that the desire for new names (thinking thereby to have a new dish) has almost obliterated the true meaning of many culinary terms; there seems to be no standard for nomenclature.

Braising is a combination of frying, stewing and baking, with vegetables, etc., formerly done in a stew-pan having a hollow cover, in which coals were put for the final browning. It is a common way in foreign lands, where ovens are not much used and fuel scanty, only a little being needed for the slow fire for stewing, and each half-burned bit carefully put out by water and laid aside for another time. Braising is now done in an earthen dish called a casserole, and foods à la casserole are becoming very popular at hotels. It may be done in a granite pan with a tight cover and finished in the oven. It is one of the most savory ways of cooking meat, game and poultry.

Smothering, or *Pot-roasting,* is done by quick searing of meat in a little of its own fat, in the stew pan or pot, then adding barely enough water to prevent burning, covering closely (formerly with a lid of dough when it was done in an iron pot before the fire), and cooking slowly in the steam of its own juices. It gives rich, undiluted gravy and very tender fibre; the best way to cook tough lean meat free from bone.

Steaming.— Real steaming is done chiefly in factories, or large establishments, where the steam is confined in boilers and superheated, and then conveyed through pipes to the kettle containing the food. Owing to the expansive force of steam it cannot be confined in an ordinary kettle, and many of our canned fruits, soups and vegetables are more successfully done there, than they could be at home. But we cook some foods over, or surrounded by boiling water, and call it steaming. In the first way, the food is placed on a perforated pan, above the water, the moist steam surrounds it, and in condensing gives up its heat, which cooks the food. In the second way, a double or farina boiler is used (or a pail inside a common kettle), the heat is conveyed by the steam or boiling water through the metal, and thence to the food, which is less hot than the water, as the metal has absorbed some of the heat. Steaming makes tough meat tender and moist, and enables us to cook vegetables and glutinous foods without the constant attention needed, if cooked over the fire, or in a little water. The Romans had a kind of double boiler, also the chafing dish, which is one variety, combined with a sautéing pan. Our grandmothers could cook a pot of hasty pudding without burning it; but with the advent of many more glutinous foods and the knowledge that many foods containing milk and eggs need a low temperature, a great variety of steamers and double boilers have come into use. Our grandmothers lived in their kitchens; it was but little work to «watch the pot» while they spun or wove, and the great kettle of cider apple sauce seldom had even a hint of scorching. But the modern housewife aims to spend as little time as possible in her kitchen. When we learn to think of it as a laboratory, it may tempt (although it may not require) a longer sojourn.

Cooking in water was probably the last to be discovered of the primitive methods, for it could not have been done until water-tight utensils were made; there were, first, baskets, made by plaiting grasses, twigs and rushes; then bowls or troughs were made by burning out hollow places in a log. Stones were heated in the fire and plunged into the water in these baskets or troughs, and this cooked the food. Indians cook their acorn mush in this way, and the Alaskans use their canoes for boilers, heating the water with hot stones, when they boil the salmon for its oil. When clay was found, they learned to shape it into bowls, then into pots with three legs, and thus had a fire-proof as well as water-tight utensil; and after this stewing came into general use. Jacob's savory venison was probably stewed. In spite of luxury, the old men in Greece preferred the black broth made of cuttle-fish. «Rome was raised on gruel,» or pulse, made of barley and vegetables, and it is probable that stewing in some of its forms has been the method in most general use, among the masses of the people, who from limitation of means and of food supplies have learned its value. Stewing is not advisable, as commonly done in America, where a large amount of fire must be kept in one of our immense ranges especially for this purpose, but when it can be done over just the small amount of fire or gas needed, it is undoubtedly the most economical and nutritious way of cooking the cheaper kinds of meat, fish and poultry, and it is capable of many variations. But the average American man of moderate means does not take kindly to cheap meat. In this «land of the free and equal,» he aims to have as nice a cut of steak as his rich employer, and his helpless helpmate probably knows no other way to cook meat save in the omnipresent frying-pan, and has no idea of the principles of the Norwegian cooker. Americans, with the best vegetables in the world, have much to learn about the cooking of them. Too much water and too little cooking are the American faults; just enough butter or oil to prevent burning, and then a slow stewing in their own juices,— saving them generally, instead of throwing them out in the water,— is the better way for many vegetables. Our beverages, our soups, our steamed puddings, our candy and many other foods, are palatable or otherwise, according to our knowledge of cooking in water. A question asked by a lady in the early days of cooking-schools shows the lamentable ignorance of many women on this important subject: «How shall I know when the water boils?»

It is interesting to note that every primitive method has its counterpart now, not only among the barbarous people, but we find that persons of the highest civilization and refinement adopt some of them instinctively, when camping necessities suggest their use, or the satiated appetite craves simplicity. No foreign chef has produced anything finer than the trout cooked on a swinging birch bough before the camp door, a potato baked in hot ashes, scalded corn-meal baked on a board on the hearth, sweet corn roasted on hot stones, a planked shad, a Louisiana gumbo, a Brunswick stew, a Rhode Island clam-bake, or beans and pork baked in a bean-hole in the Maine woods.

Revolution.— Many thoughtful minds prophesy that the next step in the evolution of cookery will be one of «revolution among the eaters themselves.» Already many have revolted against meat and other animal foods, vegetarianism having made great advance in favor. Much of the laborious part of cooking has been taken from the home to the public kitchens and bakeries, or to the manufactory of prepared foods ready for the table. The overtaxed digestive organs are demanding relief, by a change to more simple living. A few persons are beginning to understand that the man of moderate means spends too large a portion of his earnings for his food; that there is great waste of labor, fuel, heat, comfort, temper, health and morality in the cooking of food; that intemperance in eating produces as direful results as intemperance in drinking; that «a man is what he eats,» and that high thinking comes easiest after plain living.

Special directions for cooking fruits and nuts, for making breads, cake, pastries, etc., as well as for preparing the foods enumerated above, can be found in the numerous books and journals devoted to cookery. Every precaution should be taken to ensure cleanliness in the cooking of food, not only because one wishes to avoid filth, but also because unclean methods make possible the transmission of disease. In the United States and in other countries there is a growing effort to secure cleanliness in markets, food factories, bakeries, hotels, restaurants and other places where food is handled, prepared, sold and eaten. With this end in view legislation has been enacted in many places, providing for inspection and for punishment if the law is violated. See Nutrition of Man.

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Mary J. Lincoln.

Author of ‘School Kitchen Text Book.’

COOK'S EXCURSIONS. See Cook, Thomas.

COOKS PEAK. The highest summit of Cooks range in the northern part of Luma County, New Mexico, 25 miles north, slightly east of Deming. A prominent landmark to travellers on the old Butterfield emigrant trail which crosses the range not far south. Consists of porphyry intruded in Palæozoic and Mesozoic rocks. Important mining district on its east and north slopes. Altitude 8,408½ feet.

COOK'S VOYAGES. See Cook, James.

COOKTOWN, Australia, town and port of Banks County, Queensland, at the mouth of the Endeavor River, 1,050 miles northwest of Brisbane, with which and with other ports it is connected by steamship service. It is connected by rail with Laura in the gold fields, 67 miles westward. It was here that Captain Cook beached the *Endeavor* in 1770 after he had gotten her off a reef outside, having thrown his guns overboard to keep the ship afloat. Search has failed to recover the guns, which have evidently been covered up by the strong coral growths of the vicinity. A monument to Captain Cook was unveiled in 1889. There are fine public buildings, an admirable hospital, churches, schools, etc. It is the main port for trade with New Guinea, and is the outlet for a sugar country and a rich mineral country. It has pearl fisheries, coffee and rice are grown nearby, tin and gold mined. Pop. 3,349.

COOLBRITH, Ina Donna, American librarian and poet: b. near Springfield, Ill., but while a young girl went to California, where she has since lived. She has been librarian of the Oakland Public Library (1874–94); Mercantile Library, San Francisco, 1898–1900; only woman member of Bohemian Club in latter city, 1900–06. She published ‘A Perfect Day and other Poems’ (1881); ‘The Singer of the Sea; Songs from the Golden Gate’ (1895); associated with Bret Harte in the *Overland Monthly;* contributor to leading journals East and West; honorable member Athenian and California Writers' Clubs (Oakland); Bohemian, Browning, Century and Sequoia Clubs (San Francisco); Arts and Crafts (Carmel by the Sea); Pacific Short Story Club (San José); president of the Pacific Coast Women's Press Association; president of Panama-Pacific International Exposition Congress of Authors and Journalists 1915.

COOLEY, Leroy Clark, American physicist: b. Point Peninsula, N. Y., 7 Oct. 1833; d. Poughkeepsie, N. Y., 21 Sept. 1916. He was graduated at Union College 1858, taught physical science in New York State Normal College 1860–74, when he became professor of physics in Vassar College, remaining in this relation until 1907. He wrote several elementary text-books on natural philosophy, chemistry, etc., the most recent being ‘Beginner's Guide to Chemistry’ (1886); ‘Laboratory Studies in Chemistry’ (1894); ‘Student's Manual of Physics’ (1897).

COOLEY, Mortimer Elwyn, American engineer: b. Canandaigua, N. Y., 28 March 1855. He was graduated from the United States Naval Academy in 1878; in 1881 became professor of mechanical engineering and in 1904 dean of the department of engineering at the University of Michigan; was chief engineer in the United States navy during the Spanish-American War, and chief engineer officer of the Michigan Naval Brigade from 1895 to 1911. After 1900 he was known as an expert investigator and appraiser of public utilities through his work in appraising the railroads and public-service corporations of Michigan in 1900–01, 1903–05 and 1910–11, and through his municipal investigations in New York, Chicago, Boston and other cities. From 1907 to 1912 he was chairman of the Block Signal and Train Control Board of the Interstate Commerce Commission. He is a member of the American Society of Mechanical Engineers and many other learned bodies.

COOLEY, Thomas McIntyre, American jurist: b. Attica, N. Y., 6 Jan. 1824; d. Ann Arbor, Mich., 12 Sept. 1898. He was admitted to the bar in 1846 and became professor of law in the University of Michigan in 1859. He was elected justice of the Supreme Court of Michigan in 1864 and was chief justice of that State 1868–69, retiring from the bench in 1885. In 1881 he again became professor of law in the University of Michigan. His principal works are ‘A Treatise Upon Wrongs and Their Remedies’ (1878); ‘General Principles of Constitutional Law in the United States’ (1880); ‘Commentaries on the Constitution of the United States’ (1873); ‘Law of Taxation’ (1876); ‘Michigan’ in ‘American Commonwealth Series.’

COOLIDGE, Archibald Cary, American educator: b. Boston, Mass., 6 March 1866. He was educated at Harvard University, the University of Berlin, the École des Sciences Politiques, Paris, and the University of Freiburg. He was acting secretary to the American legation at Saint Petersburg in 1890–91 and secretary to the American legation at Vienna in 1893. In 1893–99 he was instructor in history at Harvard, from 1899 to 1908 assistant professor and thereafter professor; in 1911 he also became director of the university library. He was a member of the Taft party to the Philippine Islands in 1905–06, Harvard lecturer at various French universities in 1906–07 and delegate to the Pan-American Scientific Congress at Santiago, Chile, in 1908–09. In 1913–14 he was American exchange professor at the University of Berlin. He is the author of 'The United States as a World Power' (1908; French and German translations); 'The Origins of the Triple Alliance' (1917).

COOLIDGE, Charles Allerton, American architect: b. Boston, Mass., 30 Nov. 1858. He was educated at Harvard University and the Massachusetts Institute of Technology, and was in the office of H. H. Richardson, architect, in Boston from 1882 until he became a member of the firm of Shepley, Rutan and Coolidge in 1886. From 1892 to 1900 he had charge of the Chicago office of the firm. Among the notable buildings planned by him are the Ames building, South Terminal station and the new Harvard Medical School buildings at Boston; the Chicago Public Library, Chicago Art Institute, the Law School and Commons of Chicago University and the new buildings for the Rockefeller Institute, New York. He is chevalier of the Legion of Honor and member of the Society of the Cincinnati.

COOLIDGE, Susan. See WOOLSEY, SARAH CHAUNCEY.

COOLIDGE, Thomas Jefferson, American merchant and diplomat; b. Boston, Mass., 26 Aug. 1831. He was graduated at Harvard in 1850, began business as an East India merchant, but later became treasurer of the Amoskeag Manufacturing Company and closely identified with the New England cotton industry and large banking and railroad enterprises. He was president and is a director of the Chicago, Burlington and Quincy Railroad; an overseer of Harvard 1886–97; appointed Minister to France by President Cleveland 1892; and a member of the joint high commission to adjust disputes between the United States and Canada 1899.

COOLIE, a term commonly applied to unskilled laborers from India and China. The first coolie emigrants appear to have been Indians, brought from Calcutta, in India, to British Guiana, in 1839, soon after the abolition of slavery in that colony. As free negroes were found to be insufficient to perform the work that had previously been done by slave labor and the whites could not endure hard labor in a tropical climate, the planters had to look for recruits from other places than Africa. The Chinese coolie traffic was publicly recognized in 1844 when the British colony of Guiana made provision for the encouragement of Chinese immigration. For a certain specified amount, generally about 17s a month, the coolies were bound for a term of years and after 10 years' service they were entitled to free passage back to their native country. The Chinese coolies were not entitled to this back-passage. To entice the skilled laborers to remain inducements were offered them, and many did remain. The coolies employed in Guiana, chiefly from India, were in 1891 in number 105,463. The first attempt to use people from India as laborers proved unsuccessful. Various abuses existed almost from the beginning, in the treatment of the laborers. The transport ships were crowded so that few survived the passage; the survivors were often sold, and many were sent, contrary to their agreement, to work in the foul guano pits in Peru, where huge numbers perished. The Chinese Passengers' Act of 1855 put an end to the more abominable phases of the traffic. No British ship was allowed to sail on more than a week's voyage with more than 20 coolies on board, unless her master had complied with certain very stringent regulations. This ruling enabled the Portuguese to gain almost entire control of the trade. The abuses which had crept in made the trade almost as bad as the trade in African slaves. The legislature of Jamaica, in 1869, passed a law requiring more humane treatment from employers toward their coolies. Macao, the Portuguese port at the mouth of the Canton River, China, sent large numbers of Chinese coolies to Cuba and Peru and under conditions little short of absolute slavery, even kidnapping was practised with impunity. In 1866 the matter was made subject to an international conference and improvements were made by agreements signed by China, France and Great Britain. By this agreement, the legalized coolie trade between the West Indies and China was abolished. In 1904, under a convention drawn up between China and the United Kingdom, over 50,000 Chinese laborers were engaged at work in the gold mines of Transvaal. To the Malay states and other parts of eastern Asia, there is an extensive yearly migration of Chinese coolies not under contract. From Amoy alone, some 75,000 coolies emigrate yearly to Singapore and The Straits Settlements, whence they are drafted for labor purposes in every direction.

The first recorded attempt at coolie trade with India took place in 1834, when coolies were transported to Mauritius. The trade grew enormously, and all sorts of abuses existed, which were finally stopped by the Indian Emigration Act of 1883, under which contract is allowed to certain colonies only, where good treatment is assured, which includes provision for an agent residing in India under the supervision of the protector of emigrants; the informing of the coolies of the exact nature of the agreement; medical inspection of emigrants and depots; inspection and licensing of ships, etc. The British colonies to which coolies are now admitted are British Guiana, Jamaica, Mauritius, Trinidad, Saint Lucia, Saint Kitts, Saint Vincent, Grenada, Natal and Fiji; and also to the French Guadeloupe and Martinique as well as Dutch Guiana and the Danish Saint Croix. In 1900 there were 625,000 coolies in the British colonies. During the construction of the Uganda Railway large numbers of coolies were recruited in the Punjab and exported from Karachi to Mombasa. A great number, after the railroad was completed, settled in East Africa. The tea estates and pearl fisheries of Ceylon and the harvesting in Burma attracted many laborers from Tamil.

The name is also applied to the Chinese immigrants to the United States, many of whom came to the western shore of this country after the discovery of gold in California. The Chinese Exclusion Act of 1888 and the stringent laws against contract laborers have greatly limited the numbers of Chinese in this country. (See Chinese Immigration). Consult Hope, J. L. A., 'In Quest of Coolies' (1872); Jenkins, E., 'The Coolie; His Rights and His Wrongs' (1871); Grose, C. B., 'The Labour Ordinances' (Georgetown 1890) and reports of the commissions.

COOLING, Velocity of, a body isolated in air or other gas, or *in vacuo,* and surrounded by bodies colder than itself, loses heat, by radiation in the last mentioned case, and in the former case partly by radiation and partly by convection. The rate at which its temperature decreases depends on a variety of circumstances,— on the nature of its surface, for example. But, other things remaining the same, the velocity of cooling is proportional to the excess of the temperature of the body in question above that of its surroundings. This is Newton's Law of Cooling.

The law of cooling has been verified by Dulong and Petit experimentally. A copper ball was suspended in the midst of a metallic chamber, round the outside of which water was kept flowing, in order to maintain a constant temperature. The copper ball was heated before being suspended in the chamber, and a thermometer was inserted in a hole in the ball, and so arranged that the stem, which was long, projected to the outside of the chamber and could be read there. The fall of the temperature of the ball during equal intervals of time was noted, and it was found to become less and less as the temperature of the ball gradually approached that of the walls of the surrounding chamber, the law of decrease being Newton's as stated above.

The following example will illustrate practically the meaning of this law: Suppose the temperature of the ball to be 20° higher than that of the enclosure at the beginning of the experiment, and that during the first five minutes it loses 1°, that is, one-twentieth or 5 per cent of the excess of temperature. During the next five minutes it will lose 5 per cent of the excess that remains, that is, of 19°. It will therefore lose 0.95°, or the temperature of the ball will be 18.05° above that of the enclosure. At the end of the next five minutes the difference of temperatures of the ball and enclosure will be 17.15°, and so on.

COOLING SYSTEMS. See Internal Combustion Engine.

COOMASSIE, koo-mäs'sē, or **KUMASSI,** Africa, capital of Ashanti, in West Africa. The houses, formed of stakes and wattle-work filled up with clay, and thatched with palm leaves, are often furnished with arcades and ornamented with painting and carved work. Coomassie was captured in 1874 by the British, and again in 1896. In 1900 they took entire possession and it is now the seat of the British resident. It has a fort and a market-place. It was made a railroad terminal in 1903 and carries on an active trade with central Africa. Pop. 24,000.

COOPER, Anthony Ashley. See Shaftesbury.

COOPER, Sir **Astley Paston,** English surgeon: b. Brooke Hall, Norfolk, 23 Aug. 1768; d. London, 12 Feb. 1841. He studied medicine in Edinburgh and London and in 1792 he visited Paris, where he attended the lectures of Desault and Chopart. In 1793 he was appointed professor of anatomy at Surgeon's Hall; in 1802 he received the Copley medal of the Royal Society and in 1813 became professor of comparative anatomy to the College of Surgeons, and in 1822 one of its court of examiners. In this year appeared his great work 'On Dislocations and Fractures of the Joints.' Having performed a slight operation on George IV he was created a baronet in 1821, after which his practice largely increased. In 1827 he was elected president of the Royal College of Surgeons. His 'Lectures on the Principles and Practice of Surgery' appeared in 1824–27; his 'Anatomy and Diseases of the Breast' was published (1829–40), and 'Anatomy of the Thyroid Gland' (1832). He was the first to attempt the tying of the carotid artery and the aorta. These operations were not successful in his hands, but pointed the way for further research. Consult his 'Life and Correspondence' (2 vols., London 1843).

COOPER, Charles Alfred, English journalist: b. Hull, 16 Sept. 1829; d. 1916. From 1876 to 1905 he was editor of the Edinburgh *Scotsman.* He published 'Seeking the Sun' (1891); 'Letters on South Africa' (1895); 'An Editor's Retrospect' (1896).

COOPER, Colin Campbell, American landscape painter: b. Philadelphia, Pa., 1856. He studied at the Philadelphia Academy of the Fine Arts and the Julien and other academies of Paris. After a year as teacher in Drexel Institute, Philadelphia, he settled in New York. He was one of the first to give expression to the distinctive beauty of American cities, with their skyscrapers and manifold activities. A close observer, he reminds one, in his color and atmospheric effects, of the Impressionists. He also paints cathedrals and views of quaint German cities with feeling and charm. His best-known works are 'Broad Street, New York' (Cincinnati Museum); 'The Flatiron Building' (Dallas, Tex.); 'Quebec Cathedral' (Philadelphia Art Club); 'Procession of Bruges' (1906; Lotos Club, New York); 'View of Pittsburgh'; 'Beauvais Cathedral' (1912); 'The Avenue' (1913); 'Cathedral of Siena' (1913). He was awarded silver and gold medals at the Panama-Pacific Exposition, San Francisco, in 1915 and has been the recipient of numerous other awards.

COOPER, Ellwood, American horticulturist: b. Lancaster County, Pa., 24 May 1829. For 10 years he was engaged in business in Port-au-Prince, Hayti, but went to California in 1870 and devoted himself to fruit culture. He was the first manufacturer of olive oil in the United States, inventing special machinery for the purpose. He is also the inventor of machinery for hulling and pitting almonds, and for hulling and washing English walnuts. From 1885 to 1903 he was president of the California State Board of Horticulture, and for three years was president of Santa Barbara College. He has published 'Statistics of Trade with Hayti' (1868); 'Forest Culture and Eucalyptus Trees' (1876); 'Treatise on Olive Culture' (1882).

COOPER, Emma Lampert, American artist, wife of Colin Campbell Cooper: b. Nunda, N. Y. She was educated at Wells College and studied art under Harry Thompson in Paris, Kever in Holland and Chase in New York. Her principal subjects are street scenes,

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interiors and landscapes. For a time she taught painting in Rochester, N. Y. At the Chicago World's Fair (1893) she received a medal for her water color, 'The Bread Winner'; and another at the Atlanta Exposition (1895) for an oil painting, 'Behind the Dunes.' Others of her pictures are 'Mother Claudius' (1890); 'Picardy Hillside' (1897); 'High Noon, Cape Ann'; 'Old Kitchen in Gruyére, Switzerland'; 'News of the Day'; 'Canal at Lisieux.'

COOPER, Frederick Taber, American author and editor: b. New York, 27 May 1864. He was educated at Harvard and Columbia universities; was assistant in Latin at Columbia 1891–94, associate professor of Latin and Sanskrit at New York University 1895–1902, literary editor of the New York *Commercial Advertiser* 1898–1904, and editor of the *Forum* 1907–09. His writings include 'History of the Nineteenth Century in Caricature' (with A. B. Maurice, 1904); 'The Craftsmanship of Writing' (1911); 'Some American Storytellers' (1911); 'Some English Storytellers' (1912); a translation of Montessori's 'Pedagogical Anthropology' (1913); 'Thomas Alva Edison' (1914).

COOPER, George Henry, American naval officer: b. Fort Diamond, N. Y., 27 July 1821; d. Brooklyn, N. Y., 17 Nov. 1891. He entered the navy in 1837, became captain in 1867, commodore in 1874 and rear-admiral in 1881. He was on sea service for more than 25 years, and on shore or other duty for more than 18. In the Florida Seminole Indian War he served in co-operation with the army; during the Mexican War he led an assault against Point Isabel, was captured at Monterey, and after being exchanged took part in the attacks on Tabasco, Alvarado and Tuxpan; during the Civil War he commanded, among other vessels, the monitor *Sangamon,* which was on picket duty inside the Charleston roads. He was commandant of the Norfolk navy yard (1867–69); of yard at Pensacola, Fla., 1874–78; and of the Brooklyn navy yard, and in command of the North Atlantic squadron from 1880 until his retirement, 27 July 1884.

COOPER, Henry Ernest, Hawaiian politician: b. New Albany, Ind., 28 Aug. 1857. He was graduated at the Boston University Law School 1878; was admitted to the Suffolk County (Mass.) bar; and settled in Honolulu 1890. During the Hawaiian revolution of January 1893, he was chairman of the Committee of Safety, and on 17 Jan. 1893 read the proclamation abrogating monarchical government in the islands. He became a member of the advisory council in the provisional government; a Circuit Court judge 1893–95; Minister of Foreign Affairs 1895–99; acting President of the republic, January to March 1898, and has served as head of the departments of justice, public instruction, and interior, and as attorney-general 1899–1900. He retired in 1900 and now practises law in Honolulu.

COOPER, James, American senator: b. Frederick County, Md., 8 May 1810; d. Camp Chase, Columbus, Ohio, 28 March 1863. He was graduated at Washington College, Pennsylvania, 1832, studied law and began practice at Gettysburg, Pa. He was elected to Congress 1838 and 1840; to the State legislature 1843–48; was attorney-general of Pennsylvania 1848, and elected a United States senator 1849. Subsequently he settled in his native town, and when the Civil War broke out took command of the Maryland volunteers, organized them into regiments, and on 17 May 1861 was made a brigadier-general. He was in command of Camp Chase at the time of his death.

COOPER, James Fenimore: b. Burlington, N. J., 15 Sept. 1789; d. Cooperstown, N. Y., 14 Sept. 1851. His father, Judge William Cooper, removed in the year following the novelist's birth to recently acquired tracts of land, in the wilderness of central New York, about Otsego Lake, on the shore of which he had already fixed the site of the village of Cooperstown. Here he built the mansion called Otsego Hall, which his son acquired in after years, and in which he wrote the greater number of his works. Young Cooper received instruction in the family of the Rev. Mr. Ellison, rector of Saint Peter's, Albany, and then entered Yale College at 13. He neglected his studies so persistently that he was expelled in his third year. In 1806 he went to sea in a merchantman, and served in the navy in London and at Gibraltar, receiving a midshipman's commission in January 1808. He served for a time on the *Vesuvius* and then with a construction party on Lake Ontario, where he saw a new aspect of frontier life and became familiar with the details of shipbuilding. In 1811 he resigned and married a daughter of John Peter De Lancey, who came of a conspicuous Tory family. Cooper's resignation from the navy on the eve of the War of 1812 was criticized as unpatriotic and influenced by his Tory connections. For the next nine years Cooper was engaged mainly in managing and improving his farm possessions, first near Cooperstown, then in Westchester, with no discovered or suspected bent toward literature. Chancing to read a book of fiction that aroused his dislike, he professed himself able to produce a better, and being held half jocularly to the task, wrote 'Precaution,' published in 1820. It was only an indifferent novel, but it was praised by friends, and Cooper was drawn to give himself to authorship. In 1821 'The Spy' appeared, winning immediate popularity both in England and at home. Cooper's chance of success lay, not in graces of style, which he showed small disposition to cultivate, nor in imitation, but in his large knowledge of colonial and pioneer life and of the sea. In 'The Spy' he had utilized his acquaintance with many details of the Revolutionary struggle, and with Westchester as "the neutral ground." His next work, 'The Pioneers' (1823), concerned itself with life and folk in the wilderness about Cooperstown, where he had been brought up, and which he introduced under the name of Templeton, as the centre of the action. It was the first of the "Leatherstocking Series." In 1824 he published 'The Pilot,' in which he first makes use of his knowledge of seafaring. Suggested by 'The Pirate' of Scott, it was written to show how much more might be made of expert nautical knowledge than Scott had been able to effect. It really created a new literature of the sea. In another year Cooper had completed 'Lionel Lincoln,' a painstaking novel of Boston and the Revolution, but never popular. This was followed (1826) by 'The Last of the Mohicans,' which became quickly famous, being translated widely into foreign tongues. Its popularity was mainly due to skilful handling of the Indian characters, Uncas and Chingachgook, and still endures.

Beginning with 1826, Cooper spent seven years in Europe, continuing his authorship, and supplying much needed knowledge of men and things. ‘The Prairie,’ ‘The Red Rover,’ ‘The Wept of Wish-ton-Wish’ and ‘The Water Witch’ continued the series begun before he sailed. On account of distorted notions held abroad concerning the people of his country, Cooper wrote ‘Notions of the Americans; Picked up by a Traveling Bachelor’; but the book failed of its purpose, edifying Americans rather than enlightening Europeans. He wrote, besides, three novels, ‘The Bravo,’ ‘The Heidenmauer’ and ‘The Headsman,’ dealing with continental scenes and characters, but their American bias tended to lessen his popularity. His manner of meddling with unpersonal matters got him into some trouble at this time. He determined in consequence to write no more. Coming back to America, near the close of 1833, he found the general crudeness of taste and the greed of wealth more pronounced, after his foreign stay, and he did not spare his criticism. The result was greater unpopularity at home than he had incurred abroad. His combative temper prompted his putting out the satiric novel of ‘The Monikins’ (1835), which had small effect. In the three years following he published ‘Sketches of Switzerland’ and ‘Gleanings in Europe,’ in which he gives his impressions of the Swiss, the French, the English and the Italians, and renews his strictures on foreign and domestic faults. The result was increased bitterness and abuse. A dispute with the people of Cooperstown, over his rights in Myrtle Grove, on Otsego Lake, made matters worse, for the press of the State took sides against him, misrepresenting his motives and spirit in the case. Relief was at length secured from this sort of persecution; Cooper pursued the chief offenders for libel, and won his suits. In 1838 he published the two novels, ‘Homeward Bound’ and ‘Home as Found,’ and in the next year ‘The History of the Navy of the United States,’ a work long had in contemplation, and received with fresh abuse from the press. The resulting trouble was settled, by a board of arbitration, in Cooper's favor. In 1840 he published ‘Mercedes of Castile,’ and the famous ‘Pathfinder,’ followed the next year by ‘The Deerslayer,’ generally considered, with the preceding novel, the best of the Leather-Stocking Tales, which include, with these, ‘The Last of the Mohicans,’ ‘The Prairie’ and ‘The Pioneers.’ Cooper's powers of description and portraiture were now at their best. In 1842 ‘The Two Admirals’ and ‘Wing and Wing’ appeared, and in 1843 ‘Wyandotte’ and ‘Ned Myers,’ the latter being the true story of a sailor comrade of earlier years. In 1844 ‘Afloat and Ashore’ came out in two parts. Three anti-rent novels, ‘Satanstoe’ (1845), and ‘The Chainbearer’ and ‘The Redskins’ (1846) followed; and in the last-named year ‘Lives of Distinguished American Naval Officers’ appeared. ‘The Crater’ (1847); ‘Jack Tier’ and ‘Oak Openings’ (1848); ‘The Sea Lions’ (1849) and ‘The Ways of the Hour’ (1850), all indifferent novels, complete the list of his more considerable works. His death was at Cooperstown, where he had lived mainly since 1833. Cooper was of a social temper until opposition withdrew him from society. His judgments, except in matters of tact and policy, were generally acute and sound, and his integrity was heroic. His conceptions of the Indian character have been frequently disapproved, but were the fruit of deliberate study. In spite of the faults in style, he had splendid narrative ability and the power of creating characters which are clear and strong. Harvey Birch, Natty Bumppo, Long Tom Coffin and his Indian personalities are very noteworthy. His particular value to the literature of his country lies in the fact that he opened up the course of the novels concerning the origin and heart of America, and of novels of the prairies and the sea. Balzac and Hugo gave him enthusiastic praise. The standard biography is Lounsbury's in ‘American Men of Letters’ series, which also contains a full bibliography and an excellent criticism. (See Deerslayer, The; Last of the Mohicans, The; Pathfinder, The; Pilot, The; Spy, The). Consult also Clymer, ‘James Fenimore Cooper’ (1901); Richardson, ‘American Literature’ (Vol. II, New York 1887–88); Wendell, ‘A Literary History of America’ (ib. 1900); Brownell, ‘American Prose Masters’ (ib. 1909); Erskine, J., in ‘Leading American Novelists’ (ib. 1910); Phillips, M. E., ‘James Fenimore Cooper’ (ib. 1912); and essays by Mark Twain, T. W. Higginson and Brander Matthews.

L. A. Sherman,
Professor of Literature, University of Nebraska.

COOPER, Lane, American educator: b. New Brunswick, N. J., 14 Dec. 1875. He received his education at Rutgers College, where he was graduated in 1896, studying later at the universities of Columbia, Yale, Berlin and Leipzig, and the Collège de France. In 1902 he began his connection with Cornell University, becoming instructor in English there in that year, assistant professor in 1906 and full professor in 1915. He has published ‘The Prose Poetry of Thomas De Quincey’ (1902); ‘Theories of Style’ (1907); ‘Literature for Engineers’ (1909); ‘Manual of American Literature’ (1909); ‘The Power of the Eye in Coleridge’ (1910); ‘Concordance to the Poems of Wordsworth’ (1911); ‘Function of the Leader in Scholarship’ (1911); ‘Aristotle on the Art of Poetry’ (1913); ‘Methods and Aims in the Study of Literature’ (1915); ‘A Concordance to Horace’ (1916); (editor) ‘The Greek Genius and Its Influence’ (New Haven 1917); and contributions to philological and other periodicals.

COOPER, Myles, English loyalist: b. England 1735; d. Edinburgh, Scotland, 1 May 1785. He was the second president of King's College, now Columbia University, New York. He studied at Oxford, became fellow of Queen's College in 1760, and in 1761 published a volume of miscellaneous verse of correct style, but full of artificiality and classical imitations. In 1762 he became assistant to Dr. Johnson, president of King's College, and after a year as professor of moral philosophy, Cooper, then 28, was elected president in May 1763, upon the resignation of Johnson. Upon his accession the college had a faculty of four members. Both discipline and members rose during his administration, and a medical school was added. From 1767 to 1771 Cooper was in England, and after his return to America showed himself not only a typical high-churchman and Tory, but the mas-

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ter of a trenchant and sarcastic pen. He published 'The American Querist' in 1774 and in the same year wrote 'A Friendly Address to All Reasonable Americans on the Subject of Our Political Confusion,' a pamphlet answered by Alexander Hamilton, then an undergraduate at King's, and by Maj.-Gen. Charles Lee, who rivaled Cooper in virulence. His 'What Think Ye of Congress Now?' (1775) urged that Americans were not bound by the decrees of Congress, as that body had transcended the powers granted to it. In the same year he was forced to leave New York, narrowly escaping ill-treatment at the hands of a mob. His departure from America he described in a poem in the *Gentleman's Magazine* for July 1776. In England he received a parish in Berkshire after a short residence at Oxford, where he preached in 1776 a sermon entitled 'National Humiliation and Repentance Recommended, and the Causes of the Present Rebellion in America Assigned,' a violent attack on the English Whigs. During the last years of his life he was senior minister of the first Episcopal chapel in Edinburgh. John Trumbull, in 'McFingal,' speaks of "punster Cooper's reverend head," and he seems to have been a wit of rather free and convivial habits. Among the men who were educated under him were Gouverneur Morris, Robert Livingston, Alexander Hamilton and John Jay. He was the prominent classical scholar of 18th century America.

COOPER, Peter, American manufacturer, inventor and philanthropist: b. New York, 12 Feb. 1791; d. there, 4 April 1883. His early education was of the scantiest description, and in boyhood he assisted his father in making hats, at 17 learning the trade of coachmaking. He subsequently invented a cloth-shearing machine and engaged in various occupations, finally settling upon the manufacture of glue, which he carried on for half a century. About 1830 he became interested in iron manufacture and in 1845 removed his iron business from New York to Trenton, N. J., and was the first to roll wrought iron beams for fire-proof structures. In 1830 he built from his own designs the first locomotive engine ever constructed in America. He was also interested in the canal system of his native State, and, at a later date, in telegraphic communications, being president of several telegraph companies. He took an active share in the enterprise which resulted in laying the first Atlantic cable. In 1876 he was nominated for the presidency of the United States by the independent party, receiving nearly 100,000 votes at the autumn elections. In 1854 he established in New York the well-known Cooper Union (q.v.). He published 'Political and Financial Opinions with an Autobiography' (1877); 'Ideas for a Science of Good Government' (1883). Consult Carter, 'Peter Cooper' (in *Century Magazine,* New York 1883-84), and Raymond, 'Peter Cooper' (ib. 1901).

COOPER, Philip Henry, American naval officer: b. Camden, N. Y., 1844; d. 1912. He was graduated from the United States Naval Academy in 1863, served on the *Constellation* in the same year, and took part in the battle of Mobile Bay. From 1867 to 1869 he was an instructor at the Naval Academy; in 1870-71 he was connected with the Tehuantepec surveying expedition, and was superintendent of the Naval Academy from 1894 to 1898. He was commander of the *Chicago* during the Spanish-American War. He attained the grade of rear-admiral in 1902; and was commander-in-chief of the Asiatic station in 1904, in which year he retired.

COOPER, Susan Fenimore, American author: b. Scarsdale, N. Y., 1813; d. Cooperstown, N. Y., 31 Dec. 1894. She was the daughter of James Fenimore Cooper, and during the last years of her father's life was his secretary and amanuensis. She was author of 'Rural Hours' (1850); 'Fields Old and New' (1854); 'The Shield: A Narrative'; 'Mount Vernon to the Children of America' (1858); 'Rhyme and Reason of Country Life'; etc.

COOPER, Theodore, American engineer: b. Cooper's Plains, N. Y., 12 Jan. 1839. He was graduated at Rensselaer Polytechnic Institute, Troy, N. Y., in 1858, entered the United States navy as engineer officer 1861-72, and was assistant professor at the Naval Academy 1865-68. In 1872 he assisted Capt. James B. Eads in the construction of the Saint Louis bridge, becoming, after its completion, engineer and superintendent in charge. Later he held important positions with the Delaware Bridge Company, Keystone Bridge Company and as assistant engineer in charge of the construction of the first New York elevated railroads. He was one of the five expert engineers appointed to determine the Hudson River bridge span. Until his retirement he was consulting engineer for the New York Public Library and for the Quebec bridge. He is an authority on all matters relating to iron and steel construction. He published 'General Specifications for Iron and Steel Highway Bridges and Viaducts' (1885; 7th ed., rev., 1909) and 'American Railroad Bridges' (1889).

COOPER, Thomas, American physicist and politician: b. London, 22 Oct. 1759; d. South Carolina, 11 May 1840. He was educated at Oxford, studied law and medicine and was admitted to the bar. Entering into the political agitations of the period, he was sent by the democratic clubs of England to the affiliated clubs in France. In this latter country he took part with the Girondists, but perceiving their inevitable downfall escaped to England. Edmund Burke criticized with some severity the activities of Cooper and Watt in France, and provoked a caustic reply from the former, entitled 'A Reply to Mr. Burke's Invective against Mr. Cooper and Mr. Watt' (1792). Its circulation was prohibited by the British government. While in France he had learned the secret of making chlorine from common salt, and he now became a bleacher and calico printer in Manchester, but his business was unsuccessful. He next came to America, and uniting with the Democrats opposed with vivacity the administration of John Adams. For a violent newspaper attack on Adams in 1799, he was tried for a libel under the Sedition Act of 1800, and sentenced to six months' imprisonment and a fine of $400. The Democratic party coming into power, he transacted in 1806 the business of a land commissioner on the part of the State of Pennsylvania with such energy as to triumph over difficulties with the Connecticut claimants in Luzerne County, but being appointed to the office of judge, became obnoxious to members of his own party, and was removed in 1811. He then successfully occupied the chair of chemistry in Dickinson College, in the University of Pennsylvania, and in Columbia College, S. C., of which last institution he became president in 1820, and in which he was also professor of chemistry and political economy. On his retirement in 1834, the revision of the statutes of the State was confided to him, and he died in the performance of this duty. Cooper was alike eminent for the versatility of his talent and the extent of his knowledge. He published in 1794, in London, a volume of ‘Information Concerning America’; in 1800 a collection of political essays; in 1812 a translation of the ‘Institutes of Justinian’; in 1819 a work on ‘Medical Jurisprudence’; in 1812–14 two of the five volumes entitled the ‘Emporium of Arts and Sciences’; ‘A Practical Treatise on Dyeing and Calico Printing’ (1815); and in 1826 ‘Lectures on the Elements of Political Economy.’

COOPER, Thomas, English Chartist and poet: b. Leicester, 20 March 1805; d. Lincoln, 15 July 1892. While a shoemaker's apprentice he studied assiduously, and in 1827 became a schoolmaster and in 1829 a Methodist preacher. In 1841 he prominently identified himself with the Chartist movement as a leader, was editor of the *Midland County Illuminator,* and was arrested in the following year on a charge of sedition. During his subsequent imprisonment for two years in Stafford he wrote a Spenserian poem entitled ‘The Purgatory of Suicides’ and some stories published under the title of ‘Wise Saws and Modern Instances.’ He lectured much as a free-thinker in London and the provinces, but in 1855 he abandoned free-thinking and began lecturing on Christian evidences. His autobiographv appeared in 1872, his ‘Poetical Works’ in 1878 and his ‘Thoughts at Fourscore and Earlier’ in 1885.

COOPER, Thomas Sidney, English landscape and cattle painter: b. Canterbury, 26 Sept. 1803; d. there, 7 Feb. 1902. He studied at the Royal Academy School, went to France in 1827, and settled for three years in Brussels, where he learned much from Verboeckhoven. In 1833 he exhibited at the Academy, and in 1867 was elected Royal Academician. He exhibited at the Royal Academy 67 years successively. Among his works are ‘Mountains in Cumberland’ (1841); ‘Ettrick Shepherds’ (1842); ‘Cattle at Pasture’ (1843); ‘Summer Evening’ (1846); ‘Charge of the Household Brigade — Waterloo’ (1847); ‘Fordwich Meadows — Sunset’ (1850); ‘Snowed up’ (1867); ‘Milking Time in the Meadows’ (1869); ‘Passing Shower’ (1870); ‘Children of the Mist’ (1872); ‘Monarch of the Meadows’ (1873); ‘There's no Place like Home’ (1874); ‘God's Acre’ (1875); ‘Maternal Affection’ (1876); ‘A Cool Retreat’ (1877); ‘Isaac's Substitute’ (1880); ‘Summer Evening in the Marshes’ (1880); ‘On Deal Common’ (1880); ‘Scape Goat’ (1881); ‘Summer Afternoon’ (1882); ‘A Sedgy Brook in the Meadows’ (1883); ‘In the Rob Roy Country’ (1883). In 1882 he presented a gallery of art to his native town, and in 1890 published an autobiography entitled ‘My Life.’ His work is neat and highly finished in character, but conventional and displays no sympathetic study of nature, but rather an excellent imitation.

COOPER CREEK, or BARCOO, called by the latter name chiefly in its upper course, the largest inland river in Australia. See AUSTRALIA.

COOPER RIVER, a river of South Carolina, rising in the eastern part of Berkeley County, flowing across the county in a generally southerly course and emptying into Charleston Harbor. Although the river has a very short course, it is remarkable for its breadth. It forms, with the Ashley River, the peninsula upon which the city of Charleston is situated. See SOUTH CAROLINA.

COOPER UNION, or COOPER INSTITUTE, an institute founded in New York in 1854 by Peter Cooper. Its object is to provide free schools of art and science and free reading rooms and library for the working classes. The founder chose the word «Union» because he hoped that other liberal persons would unite with him in providing the means for carrying into effect his benevolent intentions. The Cooper Union building was erected at the junction of Third and Fourth avenues and cost $630,000. An endowment fund was created by the gift of $100,000 during Mr. Cooper's lifetime and another $100,000 was added by his will. The William Cooper memorial foundation was $340,000. The fund has received additional gifts from time to time from Edward Cooper and Abram S. Hewitt, and in 1899 Andrew Carnegie gave $300,000 and later $300,000 more. The increase of annual revenue amounting to $25,000 provided by the three donors last mentioned was intended for the purpose of establishing a day school and of enlarging the operations of the night classes by the addition of special instruction in chemical, electrical and thermodynamic knowledge. The expenditure made necessary by preparation for enlarging the work of the institute amounted to about $22,000 additional, which was contributed chiefly by Mr. Cooper and Mr. Hewitt. The courses in science include engineering, electricity, chemistry, physics, astronomy and mechanical drawing; and those of art include architectural, industrial and ornamental and free-hand drawing, clay modeling and painting. Instruction is given in music, English literature, wood engraving and pottery. The institute confers degrees in science and in civil, mechanical and electrical engineering. There are several scholarships. Additional advantages are offered by lecture courses, a museum, an art gallery and a library of 39,481 volumes, with a reading room containing current numbers of nearly 500 magazines and newspapers. The institute is divided into the following departments: Night School of Science, Day School of Science, Naval Architecture Class, Night Art Department, Woman's Art School, Stenography and Typewriting School, Telegraphy School, Elocution Class, Oratory and Debate Class. The annual budget approximates $205,000; the income-producing endowment to about $3,000,000, and the total value of the property in its control to over $4,000,000. The number of students in the several departments is about 4,000. The People's Institute, although holding its meetings in the Cooper Union building, is not a branch of the Cooper Institute.

COOPERAGE, the art of making vessels of pieces of wood bound together by hoops. Such vessels were in use among the Romans at the period of the Christian era. The upright pieces for the sides of a barrel or cask are called staves. The swelling at the middle of the barrel, called the belly or bulge, is formed by skilfully shaping each stave broad in the middle and narrowed at the ends so as to form part of the required double conoid. A skilful cooper can work this curve so accurately that no further fitting or alterations shall be needed when the staves are put together. The staves are made to meet at their inner edges and by driving the hoops very hard, the inner part is compressed till the slight gaping outside is closed, and thus slight inaccuracies of fitting are remedied. The bulging shape of barrel and cask seems only a fashion. It has been suggested that the purpose is only to make more difficult the cooper's trade. During the last few years a strong effort has been made to introduce perfectly cylindrical casks in their place; the room saved in packing cars, etc., being the strongest argument for the new shape, which could be made by much cheaper machinery besides.

There are several branches of cooperage. The wet or tight cooper makes vessels for holding liquids. The dry cooper does inferior work, such as barrels for containing dry goods, where an inferior degree of accuracy is sufficient. The white cooper makes churns, pails, etc., which for the most part have straight sides. The best work is made of oak, which must be thoroughly dried before being put together. Other woods employed are elm, pine, gum, beech and bass in the order named. In warm countries, the drying of the sun is sufficient, and casks are therefore mounted in summer only; but in the United States, artificial drying is commonly resorted to. The hoops are hammered down from the narrow to the wide part of the cask, by means of a mallet striking a piece of wood held against the hoop. Iron hoops are sometimes put on hot, in order that their contraction on cooling may bind the work together. Most ingeniously constructed machinery is now generally used in barrel-making. Like most other processes of manufacture, the cooper's trade has changed in modern times, with the substitution of machinery for hand work. Barrel-making machinery may be divided into machines for the manufacture of staves, machines for manufacturing heads and machines for setting up and finishing the barrel. Consult Wagner, 'Cooperage: A Treatise on Modern Shop-Methods and Practice' (Yonkers, N. Y., 1910); Newlin, "Tests of Wooden Barrels," in 'Bulletin of the United States Department of Agriculture, No. 86' (1914). Statistical bulletins on tight and slack cooperage stock are compiled by the United States Census Bureau in co-operation with the Forest service of the Department of Agriculture and are published annually. Other bulletins from the Forest Service dealing with cooperage are issued from time to time.

CO-OPERATION, in modern parlance the association of people for the accomplishment of any desired end, especially the association of working people for the management of their industrial interests in store, workshop or other undertaking, and the equitable distribution of profits. The advantages of co-operation consist in the lower prices paid for the ordinary articles of life and of manufacture, the common use of capital, machines, buildings, water power and in common production. Instances of co-operative industry have been discovered among English miners and New England fishermen in the 17th century and among Greek sailors of the Levant. Co-operative societies established as early as 1777–95 are still in successful operation. The earliest in England was founded in 1794 at Mongewell, in Oxfordshire, by Shute Barrington, bishop of Durham. During the Owenite agitation, between 1820 and 1845, hundreds of co-operative societies rose up. Robert Owen (q.v.), failing to convert his brother manufacturers to the innovations he had introduced for the benefit of his operatives in his New Lanark mills, appealed to the government to adopt measures that would alleviate the poverty of the laboring masses, but without success. He therefore abandoned these efforts and turned to the task of establishing co-operative communities that would put his ideas into practice. One hundred and seventy shops had been organized under the Owen plan in 1830, but four years later most of these had ceased to exist.

The modern movement first took practical and permanent form with the formation of the Rochdale Society of Equitable Pioneers in 1844. The founders were 28 Lancashire weavers, nearly all Socialists of the Owen school and Chartists. The original capital was $140, slowly collected by subscription of two pence, and afterward three pence, a week. With this capital they opened a store for supplying themselves with provisions; but at first they had only flour, butter, sugar and oatmeal to sell. They limited the interest on shares to 5 per cent, and divided the profits among members in proportion to their purchases. When it was proposed to take out a license for the sale of tea and coffee the members did not pledge or subscribe amounts, but "promised to find" small amounts ranging from two pence to one pound, and the latter sum was actually the largest offered. A motion was made that members who would not trade with the store be paid off, but those who desired to see co-operation advance under the principle of freedom opposed the motion, and it was withdrawn. At the end of 13 years they had a membership of 1,850, a capital of $75,000 and their annual sales amounted to $400,000. This successful society with its organization and methods of conducting business became a model which was followed in many parts of England and abroad. In 1864 a wholesale society with annual sales amounting to over $200,000,000, with a membership of 1,512,399 and a capital of nearly $330,000,000 was established at Manchester, and in 1869 a second at Glasgow. They work in harmony and are practically one institution. The wholesale society is a federation of retail societies for the supply of goods to the various societies composing it, with purchasing and forwarding depots in England, the United States and on the Continent. It owns eight steamships. It has extensive productive works, boot and shoe factories, woolen cloth works, corn mills, etc. There is also a co-operative fire and life insurance society. Since the inception of the co-operative stores in Great Britain a business of $4,500,000,000 has been transacted and $360,000,000 in dividends paid to their members. The Woolwich Society is an organization of 10,000 men and women. They own six stores, the finest bakery in London, farms, stables, tailor shops, boot and shoe works, etc. One of the most notable examples of that kind of co-operation that includes profit-sharing is the South Metropolitan Gas Company, whose receipts are shared with 3,000 employees. The Leeds Co-operative Store is perhaps the most famous single experiment. It is evident that probably 1,000,000 families, or a sixth of the whole population of England, have their wants in whole or in part supplied by co-operative stores.

Building and loan associations (q.v.) are purely co-operative organizations, and existed in form in England as early as the latter part of the 18th century. The date generally assigned for their beginnings in that country is 1836, for in that year Parliament adopted an act for their regulation. The Friendly societies are co-operative in reality, though not in name. In 1827 the first English paper for the propaganda of co-operation was established, entitled the *Brighton Co-operator*. In 1871 the *Co-operative News* was established as the organ of the societies. Since 1869 annual congresses of co-operative societies have been held throughout England. The Congress of 1902 had 1,100 delegates, with reports for 1901 from 1,604 societies, giving a membership of 1,919,555; a gain of $7,291,000 in shares, $2,574,474 in profits and $6,614,124 in investments. Nearly $45,000,000 was distributed to members during the year as cash dividends. The number of societies in 1912 was 1,557, with a membership of 2,661,799; the aggregate trade transacted $557,913,895, with profits of $60,122,405. In the Australian colonies co-operation has made a marked advance. There are many Friendly societies there. In 1873 the Co-operative Union was consolidated, with a regular constitution. It is governed by a board of 12 members, representing the six sections into which the union is divided. There were 48 additional societies not reporting. The movement for co-operation in Ireland has lately shown a decided progress. There are in the island 232 co-operative dairy or creamery societies, 101 agricultural societies, 52 co-operative banks and 39 other organizations; total membership 40,000. Although in Great Britain co-operation has succeeded best in the form of distribution, that is, in co-operative stores for supplying the domestic wants of the workman's family, in continental Europe other phases of the movement have been more prominent.

In France co-operation began with the Revolution, and that nation is one of the few in which the state has stepped in to aid associative ventures of this kind. Building contracts have been awarded co-operative industries by the government, and M. Waldeck-Rousseau's known friendliness to the principle has awakened encouragement among the members of the various societies. Co-operation in different modes of agriculture has achieved some success in France. In 1900 there were 2,500 co-operative societies, 1,489 being devoted to distribution. Two hundred and fifty workshops are operated according to this principle. Paris has a very large and successful society. In Germany and Italy the co-operative idea has led to the formation of many people's banks, furnishing mutual credit to workmen and also small tradesmen. The People's Banks in Germany were founded by Schulze-Delitzsch, the probable date being 1851, Schulze-Delitzsch traveling through Germany, addressing large audiences and explaining his plan. He encountered the most determined opposition. Bismarck obstructed the movement. Yet these credit loan institutions spread, and Germany to-day possesses thousands of them. Schulze-Delitzsch himself organized 3,000. There are many throughout Europe. These banks charged in the beginning a high rate of interest — 12 to 14 per cent — though it has since become much lower, and only short-time loans are permitted. The members of most of these credit loan institutions hold but one share, the price of which is placed high, and this is paid in small installments, the object being to encourage the inclination to save. While these banks or loan associations put the lender's interest foremost, Raiffeisen, another German, organized a co-operative bank in 1849 which placed the borrower's interest as the keystone of his system. The total membership of co-operative societies in Germany is about 2,000,000. Productive societies to the number of 255 are engaged in a large variety of industries. There are 1,527 societies engaged in distribution. The spread of the co-operative idea has been especially remarkable in Switzerland and Denmark. In Switzerland in 1897 there were 2,223 co-operative societies, 838 of which were co-operative dairies. These had grown in 1900 to 3,400 societies, 1,400 being dairies. There were 370 organizations for distribution. One-sixth of the population are co-operators. In Denmark there are 837 distributing societies and 1,052 co-operative dairies producing an annual output of butter worth $34,000,000.

The agricultural societies were organized in five central bodies, their aims being to purchase provisions, to sell their own products at a profit, to protect their members against over-production, to diminish the cost of production and to improve and educate their members.

At the end of 1897 there were in the Netherlands 697 societies, 253 of which were for exploiting milk, butter, cheese and other products. In 1900 the total number of organizations had grown to 2,000. The co-operative societies of Belgium numbered 1,000, the dairies leading (227), and doing a business of $3,250,000. In Ghent there is an organization of 25,000 workingmen sharing the profits of stores and factories conjointly owned. A vast baking system is carried on in the same way. Marked progress has been made in Italy, where the Church has taken an active interest in organizations for the benefit of the people. There are in that country 1,200 distributing societies with annual sales amounting to about $10,000,000; 1,737 co-operative banks; 750 dairies and 513 productive labor societies.

In Hungary an interesting feature of co-operation is the share which the state takes in it, as a member adding 1,000,000 crowns to the capital. In that country there are 1,002 banks, many dairies and various other co-operative undertakings. Austria has 5,092 organizations, most of them being of the nature of credit societies. Figures for Russia are not available later than 1896; 1,442 societies were then in existence, 605 of which were banks. Even in Spain the movement is being felt, though the number of its adherents is comparatively small.

In the United States co-operation has made comparatively slow progress. A co-operative store in Kingston, Mass., is said to be the oldest existing experiment on the Rochdale plan. It was organized in 1875, but its annual trade is small. There were various co-operative associations formed in the late forties and the early fifties. A bulletin of the Department of Labor issued in 1896 states that "none survive." In modified form, however, one or two still exist, among which is the Protective Union of Worcester, Mass., and the Central Union Association of New Bedford, Mass., organized respectively in 1847 and 1848. In 1886 co-operative business in New England included creameries, banks and building associations. A co-operative coopering association was established in Minneapolis in 1874. In 1882 the students of Harvard University formed a society for supplying themselves with books, stationery and other articles. It has been a great success and has been imitated at Yale and other colleges. The co-operative creameries in certain of our northwestern States have achieved an astonishing measure of success. Minnesota probably leads in the number and value of creameries in the United States, though New England — Massachusetts notably — has many of them. In 1901 more than 50 Farmers' Co-operative Grain associations were formed in Kansas. The Co-operative Association of America, organized during the same year, in Lewiston, Me., was started with the purpose of developing a federation of various lines of business, beginning with a grocery. The profits are divided semi-annually among the co-operators. In 1901–02 the association accumulated $250,000 and reported a business of $600,000. There are many co-operative communities in the United States, varying much in their methods and characteristics. They have been classified as communistic, socialistic and partially co-operative. So far as it has gone the co-operative movement has been a real and effectual training for the intelligence, business capacity and moral character of the workmen. It has taught them thrift, foresight, self-control and the habit of harmonious combination for common ends. Experience seems to show that where articles are produced to order and not for the general market co-operative production may succeed, but that these enterprises fail when they are confronted with the difficulty of adjusting the supply to the variations of the market demands. The success of co-operation in certain agricultural processes is essentially an incident in the marketing of products and bears no close relation to productive co-operation properly so called.

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CO-OPERATIVE BANKING. The idea of co-operative banking was conceived by Herman Schulze-Delitzsch and was first put into practice in 1849 at Eilenburg, Prussia. It grew out of his effort to rescue a number of carpenters and shoemakers from usury and to obtain money for them at fair terms upon their joint and several liability for buying the raw materials needed in their trades. The success of this venture led to various plans for people's banks and credit societies, based on co-operation for encouraging thrift in their neighborhoods and for extending financial assistance to their members for productive or provident purposes.

What Co-operative Banking Means.— Co-operation is the voluntary union of persons for utilizing their faculties or resources, or a part of them, under their own management in some economic enterprise carried on upon their common account with a view to their individual through their mutual benefit. A bank to be co-operative must be composed of members having this same aim and be so organized that they shall control its management, participate in its profits and losses and have the exclusive use of its credit facilities. The bank may borrow and even receive deposits from outsiders, since these are ways of utilizing collective credit for the members' benefit. But it cannot lend to outsiders, because if it should allow them to use its funds or resources, it would be extending benefit to persons who had no voice in the management nor responsibility for the losses. This would impair its co-operative character and make its members simply a group of capitalists seeking profit for themselves without regard to the best interests of others. The bank, however, may invest in market securities to prevent its funds from lying idle.

The banks are formed either as joint-stock companies, or associations issuing shares, or as associations not issuing shares. The joint-stock company has the objection that its capital stock is a specified and fixed amount and that share investments therein cannot as a matter of law be withdrawn at a member's will nor ordinarily be canceled and returned by the bank upon his expulsion or retirement. This violates one of the essentials of co-operation, which requires the relation between the parties to be voluntary and dissolvable by either of them. Moreover, it is prejudicial to members that desire to keep their money within reach in case of need, while it deters persons from joining who might wish to resort to the bank only for occasional or temporary purposes. These statutory objections may, of course, be removed by contract. But the arrangement is not entirely satisfactory, and no co-operative bank has ever been formed as a joint-stock company except where the laws on associations were lacking or defective.

The associational co-operative banks are bodies incorporated under general laws which authorize licenses or charters to be granted upon filing articles of agreement and voluntary dissolutions to be effected upon complying with a few cheap and simple formalities. The first law was that enacted by Prussia in 1867. From this law and many others enacted in Europe, it may be gathered that an association must have no limit for the number of members, except that it shall not be less than the minimum for incorporators; and, if the association issues shares, no limit must be set for the number of these beyond the amount that may be held by one member. The shares may be paid at once or by periodic instalments and must be subject to withdrawal. So the fund thus obtained increases or decreases according to payments or withdrawals made on shares and to any change in the number of members or of outstanding shares. Hence it is variable; and since it belongs, not to the association itself, but to the contributing members and must be returned to them upon retirement or expulsion, it is altogether different from a fixed capital stock and is called "share capital." These are the points which distinguish an association from a joint-stock company.

The articles of agreement must set forth all the important facts of the organization and administration of the bank and the methods of managing it, besides showing the choice made among any alternative forms or features allowed by the law. The delimitation of area, qualifications as to membership and special terms for admission and expulsion are optional. Many a bank restricts its area, makes residence within that area, or some particular occupation, race or religion a condition of membership, and exacts fees on entrance and fines for withdrawals, defaults or derelictions. If shares are issued, only one kind is permitted and 10 per cent or so must be paid upon subscription. The articles must prescribe the par value and the manner of payment and the number of shares that may be held by one member, and the vote required for a decision on questions determined by more or by less than a majority. Plural voting may be allowed in a bank with shares, but in a bank without shares a member never has more than one vote. The member's liability must also be defined. This lasts for two years or more after retirement, and may be any one of three kinds.

In a bank without shares the liability may be unlimited, i.e., its creditor may hold members personally liable and sue all or any of them; or it may be contributory, i.e., the bank or its receivers may levy equal assessments against all members and repeat the process down to the last one financially responsible, until all the bank's debts have been paid. A member who pays more than his equitable portion has the right of recovery against other members. In a bank with shares the liability may also be unlimited or contributory, but usually it is limited and runs in favor, not of its creditors, but only of the bank or its receivers; they may call immediately all what yet remains unpaid on the share or assess any member on his share up to a specified multiple of its face value. In practice, the assessments are rarely made except equally against all. A member of an unlimited-liability bank is forbidden to belong to any other bank. A ratio must be fixed at which assets, together with members' liabilities, shall be maintained to the bank's outstanding debts. If assets fall below this ratio, bankruptcy proceedings must be instituted. The articles must specify the percentage of the profits to be annually set aside for a reserve, and what shall be done with the reserve upon dissolution.

Administration.— The administration is composed entirely of members elected or subject to removal by members at a meeting regularly held or for that purpose specially called. It consists of a board of directors, which selects the officers, usually from their number, and of a committee of supervisors, with power to set aside any act of the board and to suspend any director, officer or member. The size for these bodies varies under the different laws. No person may serve on both the board and the committee at the same time. Nor may credit be extended to any director, supervisor or officer, or upon his endorsement, without the consent of the members. A bank may have a finance committee. Officers are selected for one year. Directors and supervisors may be elected for three years, but then it is so arranged that the terms of one-third of the board and of the committee expire annually. They may be re-elected. Salaries or compensation may or may not be allowed. Official inspection and a periodical making and publishing of reports are required. The business may be simply that of a loan and savings society or extend to commercial banking. It may include collective buying and selling for members. Loans must be amply secured, the endorsement of one or more members being the usual security. Real estate mortgages are rarely taken, except to protect endangered claims. Rebates or dividends may be distributed, but at least a portion of the annual profits must be placed in the reserve. This fund is indivisible and, in the event of dissolution, passes to the government or trustees to be held for some new bank in the same locality or for use in some public object of benefit to such locality. In a bank without shares, all the profits are turned over to the reserve.

Chief Purpose.— The chief purpose of co-operative banking is the organization of credit. This distinguishes it from the operations of loan and savings societies, the object of which is mainly to encourage thrift. Co-operative banks flourish only where their members are able to utilize in their own individual businesses the money and credit made available; and they succeed best when each business has a productive or creative character. In the cities the members are tradespeople, owners of shops and stores, grocerymen, butchers, tailors, shoemakers, fishermen with their own outfits, artisans and the like, together with skilled workmen and frugal and industrious persons seeking to save money or to strengthen their financial standing with a view to setting themselves up in business. They invariably adopt the share-issuing, dividend-paying, limited-liability form, of which there are two major types. The first is the *Schulze-Delitzsch* bank, in which the shares are large — sometimes even $1,000 apiece — and a member is allowed only one vote. Officers are paid for their service. The other is the *Luzzatti* bank, in which the shares are small — $10 or under — and plural voting is allowed with a maximum usually of 10 votes for a member. Service of officers is gratuitous. Both have all ordinary banking powers and are called "people's banks." Many have become large and a few have acquired numerous members and enormous assets. Urban people's banks not infrequently belong to leagues for promoting and safeguarding their general interests, but they rarely combine for mutual financial assistance.

In the rural districts the co-operative banks admit to membership country-store merchants, blacksmiths, persons engaged in or connected with agricultural pursuits, school-teachers, priests, preachers, professors of agricultural colleges, agricultural government officials, agronomists and bankers along with the farmers. Often members not farmers are elected on their boards and committees. The banks, however, devote their funds exclusively to agriculture, and they combine to help one another. Differently from urban banks, their tendency is to become parts of a system having three degrees of organization. The first degree is a local rural co-operative bank or a group of associations centring around such bank. The second degree is the regional or provincial unions, each with a central bank and central commercial and industrial associations. The third degree is the federation, with a bank and associations having a national scope. Usually the officers of the federation and its associations are elected by the unions, the officers of each union and its associations are elected by the adherents composing its various local groups, and the officers of the latter are elected by their individual members. The banks of the federation and of the unions of this system have shares, pay dividends and limit the liability. But in many instances the local banks impose unlimited liability, issue no shares and put all profits into the indivisible reserves.

These are called *Raiffeisen societies* in honor of Frederick William Henry Raiffeisen, whose ideas and work for the Prussian peasantry led to the formation of the first society of the kind in 1862 at Anhausen, and to the inauguration in 1869 at Heddesdorf of the rural co-operative credit movement which now embraces all Germany. Besides the features already noted, a German Raiffeisen society confines its area to a rural section containing by preference not more than 2,000 inhabitants and so remains small. No entrance fees are charged. The members must profess some Christian faith and bind themselves to deposit all their savings with the society and use none but its facilities in their affairs. Directors, supervisors and officers, except the secretary-treasurer, must serve gratuitously.

The powers of a Raiffeisen society comprise buying, selling and supplying various agricultural needs, as well as receiving deposits and extending credit. Loans are subject to recall on four weeks' notice, and on this condition may be granted at long term for acquiring farms. The borrowed money must be used only for a specific productive purpose. The society must join the federation and obligate itself to do no business with the outside world, except through the federation's banks and associations. The affiliated society buys their shares and bonds with its excess funds. Thus it serves as a basic unit and financial support of the system in return for advantages obtained therefrom. It attracts members by enabling them to economize their resources.

Laws Enacted.—Following Massachusetts in 1909, laws were enacted on credit unions in New York in 1913; on credit unions in North Carolina in 1915; on co-operative banks and on credit unions in Oregon in 1915; on agricultural credit co-operative associations in the Philippine Islands in 1915; on credit unions in Rhode Island in 1914; on co-operative unions in South Carolina in 1915; on rural credit unions in Texas in 1913; on co-operative banks for personal credit in Utah in 1915; and on co-operative credit associations in Wisconsin in 1913. With the exception of the co-operative banks in Oregon, the associations authorized by these laws do not possess ordinary banking powers. None can carry out the principles and practices of either Schulze-Delitzsch, Luzzatti or Raffeisen. They are all intended rather for encouraging thrift and for granting loans on security other than real estate than for organizing credit or for supporting co-operative systems.

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MYRON T. HERRICK,
R. INGALLS.

COOPERIA, koo-pē'rĭ-ạ, a genus of plants of the *Amaryllis* family (*Amaryllidaceæ*), so named in honor of Joseph Cooper, a curator of the Botanical Society of London. They are low herbs with coated bulbs and narrow grass-like leaves, with flowers somewhat resembling the atamasco lily. There are two known species in the United States, natives of the Southwest, and of Mexico. Drummond's Cooperia (*C. Drummondii*) grows on the prairies from Kansas through Louisiana to Texas, New Mexico and Mexico. The flower is very fragant, and because of its habit of blooming at night or in the early evening it is known as the evening star. The giant fairy-flower (*C. pedunculata*) is a favorite for cultivation, as it thrives well in ordinary garden soil, and if placed in a root-cellar in dry soil with an even temperature, will bloom again in the spring.

COOPERSTOWN, N. Y., village and county-seat of Otsego County, at the outlet of Otsego Lake, and on the Delaware and Hudson Railroad, 90 miles west of Albany. It is noted as having been the residence of James Fenimore Cooper, the novelist. It has Thanksgiving Hospital, a Union free school, knitting mills, national bank, a box factory and a cheese factory. This was once an old Indian town, but as early as 1769 was owned by George Croghan, and in 1785 was purchased by William Cooper, the father of James Fenimore Cooper. It is growing in popularity as a summer resort. It is in a hop-growing and farming region. Consult Halsey, 'The Old New York Frontier' (New York 1901). Pop. 2,484. See Cooper, James Fenimore.

CO-ORDINATES. See Geometry; Geometry, Cartesian; Geometry, Elementary; Geometry, Line; Geometry, Modern Analytical.

CO-ORDINATION (Lat. «arranging in order,» «ranking together»), a physiological and psychological term, indicating the normal and harmonious operation of the muscles, especially the voluntary ones, in such actions as walking, motion of the arms and mastication. Co-ordination is dependent on the perfect and complete action of the sensory nerves, more especially those of the muscular sense and of the semicircular canals (See Ear), of the cerebellum and of the motor nerves and upon the healthy condition and proper interrelation of the muscles concerned. Its failure is usually due to affections of the brain or spinal column and is styled ataxia (q.v.).

COORG, koorg, or **KOORG,** British India, province bounded by Mysore on the east and northeast and the districts of South Canara and Malabar on the west; area, 1,582 square miles. Its greatest length from north to south is 60 miles, and greatest breadth from east to west 40 miles. It has a rainfall of 133 inches annually. The country in general is extremely rugged and covered with forests, in some parts abounding in sandal and other valuable woods, but in others overrun with jungle, the resort of elephants and beasts of prey; climate is temperate and healthy; soil fertile and in many parts well cultivated, yielding in abundance rice of superior quality. Great numbers of cattle are reared. The growing of coffee is an important industry, the bulk of the product being exported to France. The manufactures are insignificant. The province was added to the British dominions in 1834. The capital is Merkara. The old fortifications are interesting. High ramparts and deep ditches are so arranged as to be most effective in checking the advance of an enemy. Pop. 174,976.

COORNHERT, kôrn'hĕrt, **Dirck Volckertsen,** Dutch poet and scholar: b. Amsterdam 1522; d. Gouda 1590. In 1562 he became secretary of the city of Haarlem and opposed the Spanish power, until he was imprisoned for a short time, and on his release forced to flee to Cleves and Xanten. In 1572, when the Dutch successfully revolted against Spain, he was made state secretary of the States of Holland. He was a well-known theologian, vigorously opposing the orthodox Protestant party. By his poetical writings, as also by his elegant translations from Boccaccio and the classics, he earned the title of «restorer of the Dutch language.» His poetical works include 'Abrahams rytgang' ('The Death of Abraham'), and 'Comedie van de blinde van Jericho' ('Comedy of the Blind Man of Jericho'). His prose works include 'Zedekunst, dat is wellevens kunst' ('Ethics, that is, the Art of Right Living') which appeared in 1586, and deserves special mention. Consult Moorres, 'D. V. Coornhert de Libertijn' (1887).

COOS BAY, an indentation on the coast of Oregon in lat. 43° 45′ N. in Coos County. It extends into the land about 10 miles and is only one mile in width, thus making it a safe harbor. Marshfield and Empire City are on Coos Bay.

COOSA, koo'sạ, **RIVER,** in Floyd County, in the northwestern part of Georgia, is formed by the junction of the Ostanaula and the Etowah rivers; it flows southwest into Alabama and about eight miles north of Montgomery it unites with the Tallapoosa River and forms the Alabama. Its length is about 350 miles. It is navigable for boats of light draft from its mouth to Wetumpka and from Greensport to Rome, Ga., and drains an area of 10,000 square miles.

COOSY, koo'sē, or **KUSI,** a river of India, rising in Nepal and flowing first south-southeast to the British frontier, and then nearly due south to the Ganges. It is very rapid and difficult to navigate. It is noted for its destructive floods. Its total length is about 325 miles.

COOT, a strictly aquatic bird of the genus *Fulica*, sub-family *Fulicinæ* and family *Rallidæ*, also called water-hens and crow-ducks. About 10 species are known, distributed throughout the world; but mostly in South America, which has six. The American coot, *F. americana*, is abundant throughout North America, breeding wherever found and resident in the South. Its appropriate habitat is shallow reedy ponds, and sluggish streams. The nest is a disordered heap of reeds or similar material in or near the water, in a hollow of which 8 to 12 eggs, clay-colored, with brown spots, are deposited. The length of the bird is 14 to 16 inches, but the body is remarkably compressed, and the feet are nearly unique in the lobate webbing of the toes. The color is generally sooty slate, with the lower belly and some other parts white and the bill red at tip and base. The coot is much sought by gunners about the interior lakes. The European coot (*Fulica atra*) is a closely similar bird, slaty in color, with a bare patch on its head, whence the name bald coot; it is found throughout Europe and in Asia.

COOTE, Sir **Eyre,** British military officer: b. County Limerick, Ireland, 1726; d. Madras, 26 April 1783. He entered the army at an early age, and from 1754 to 1762 served in India. It was by his arguments that Clive was induced to risk the battle of Plassey, and for his services in this and other engagements, Coote was in 1759 given the command of the newly raised 84th regiment. In this year he gained the great victory of Wandiwash; and his capture of Pondicherry in 1761 completed the downfall of the French in India. Coote returned to England, and was knighted in 1771. In 1779 he assumed the command-in-chief in India, with the rank of lieutenant-general, and in 1781 he routed Hyder Ali at Porto Novo.

COPAIBA, kō-pā'ī-ba, the oleoresin of *Copaiba Langsdorfii* and other species of copaiba. Of these at least 16 are known to give this drug, and seven are known to yield a product that is sent to the United States. Oleoresin copaiba comes mostly from Brazil and the West Indies; it is found in special secretory passages in the wood from which it is obtained by deep gashes cut into the tree, much as turpentine is obtained from pine trees. The oleoresin flows in a steady stream, one tree often yielding as much as from 10 to 15 gallons. Copaiba as it comes into the market varies much in age and variety. The finer sort of Pará copaiba is a thick liquid, clear, somewhat resembling Canada balsam. It may be darker, sometimes resembling sherry. It has a specific gravity of .92, does not mix with water, but is soluble in ether. Distilled with calcium hypochlorite it yields chloroform. Copaiba oil has a peculiar aromatic odor which is extremely disagreeable. The chemical composition of copaiba is extremely complex. It contains at least from 40 to 80 per cent of oil and a large amount of resin, which consists largely of copaivic acid ($C_{20}H_{30}O_2$). Oxycopaivic acid and metacopaivic acids are also found. The action of copaiba is largely exerted on the genito-urinary system, where it acts as a stimulant diuretic and irritant, and is particularly useful in diseases of the bladder, urethra and mucous membranes of the pelvis and of the kidneys. It may be used in bronchial affections also, but is rarely thus employed because of its disagreeable taste and because it very frequently causes an eruption. It is usually administered in gelatine capsules. Its chief commercial use is as a vehicle in oil painting and as a varnish.

COPAIS, kō-pā'is, formerly a lake of Greece, in Bœotia, fed mainly by the river Cephissus. In 1886 a French company undertook to drain off again the water, and after working for some time they were superseded by an English company. In 1894 the work was completed and about 60,000 acres of good soil was reclaimed. Consult Curtius, 'Die Deichbauten der Minyer.' See BŒOTIA.

COPAL, a group of very hard resins derived from a great variety of plants both recent and fossil, the botanical names of which are not determined beyond doubt. Its chemical composition is: Carbon 78 to 80.5, hydrogen 8.7 to 10.5 and oxygen 9 to 10.7 per cent. The harder sorts are chiefly derived from fossil sources. In the recent state the resins have been obtained from species of *Hymenæa verrucosa* and *Guibourtia* from Africa, South America and the West Indies. Copal occurs for the most part in irregular pieces. As found in nature all of the fossil gums are covered with a crust of oxidized gum, the result of fossilization. This must be removed by chipping or scraping, or by the aid of alkalis, to prepare the gum for market. The Zanzibar and Angola varieties then have a characteristic "goose-flesh" appearance. Copal is without taste or odor; it has a conchoidal fracture, and a tendency to break into six-sided fragments. It is used in the manufacture of varnish, its particular value arising from its hardness, which is about 3 of the mineral scale. It can be dissolved in aniline oil. The softer varieties are of recent origin, and are known as "spirit copals" because soluble in alcohol or turpentine.

COPALCHI BARK, a bark resembling cascarilla bark in its properties, and produced by a shrub of the same genus, *Croton Pseudochina*, a native of Mexico and of Central America. The bark comes to Europe in quills a foot or two in length, and has a thin corky epidermis. Copalchi bark is much used as a substitute for cinchona in Mexico, where it goes by the name of *Quéna blanca*, and is imported, though not to a large extent, into Europe. It contains a minute proportion of a bitter alkaloid resembling quinine, and is somewhat weaker than cascarilla bark.

COPARCENARY, in law, partnership in inheritance; joint heirship in which each is entitled to a distinct share of the benefits, while the property remains undivided. It commonly arises from the custom of dividing equally among coheiresses the property of a man who dies intestate; but even in England, where the eldest son is usually sole heir, local custom may create coparcenary among male heirs.

COPE, Charles West, English painter: b. Leeds, 28 July 1811; d. Bournemouth, 21 Aug. 1890. He studied at the Royal Academy and in Italy, and first exhibited at the Academy in 1831. In 1843 he gained a prize of £300 for his picture, 'The First Trial by Jury'; in 1844, by his fresco, the 'Meeting of Jacob and Rachel,' he secured the commission for one of six frescoes for the House of Lords, producing accordingly 'Edward the Black Prince Receiving the Order of the Garter.' Altogether he executed eight frescoes from English history of the 17th century for the House of Lords, while his other works were numerous, the subjects being historical, romantic or domestic. Of these some of the most important are 'Nereids' (1836); 'Cotter's Saturday Night' (1843); 'Last Days of Wolsey' (1848); 'King Lear' (1850); 'Milton's Dream' (1850); 'Pilgrim Fathers' (1857); 'Evening Prayer' (1860); 'Spring Flood' (1865); 'Shylock and Jessica' (1867); 'The Disciples at Emmaus' (1868); 'Yes or No?' (1873); 'Taming of the Shrew' (1874); 'Anne Page and Slender' (1875); 'Selecting Pictures for the Royal Academy Exhibition' (1876); 'Bianca's Lovers' (1877); and 'Far away Thoughts' (1881). His etchings have also been much admired. He also illustrated the de luxe editions of Gray's 'Elegy' (1847); Goldsmith's 'Poetical Works' (1845); Thomson's 'Seasons,' etc. He became A.R.A. in 1843 and R.A. in 1848. Consult Cope, C. H., 'Reminiscences of C. W. Cope' (London 1891).

COPE, Edward Drinker, American zoologist and palæontologist: b. Philadelphia, Pa., 28 July 1840; d. there, 12 April 1897. Oliver Cope came to this country from Wiltshire, England, about 1687 and settled on Naaman's Creek in the northernmost part of the State of Delaware. Oliver's grandson, Caleb, a member of the Society of Friends, was burgess of Lancaster, Pa., in 1776, and incurred the indignation of his fellow-townsmen for offering the hospitalities of his house to Captain (afterward Major) André and other British prisoners captured at Saint John's, Canada, by General Montgomery. Caleb's son, Thomas Pim Cope, settled in Philadelphia, and established the Cope packet line, trading between that city and Liverpool. Thomas Pim Cope's son Alfred married Hannah Edge and was the father of the subject of this sketch.

During the first seven years of Edward's life he was educated at home, and gave early proofs of a restless inquisitiveness and an accuracy of reasoning on what he had observed, very rare in so young a child. At 13 he entered the Friends' School at Westtown, Chester County, Pa. As a young man of 18 he announced to his family that he was to be a naturalist.

His father tried to make a farmer of him, and for this purpose gave him a farm near Coatesville, Pa. He learned much of the flora and fauna of this region, but revolted at the thought of settling down to this monotonous life. He longed to grapple with the larger problems of biology, and broadly hints this in a letter of 1858: «Dr. Leidy is getting up a great work on comparative anatomy.» . . . «Such a work will be very useful to those who want to go to the bottom of natural history; it is an interesting study, too, to notice the modification in form, the degradations, substitutions, etc., among the internal organs and bones. The structure, forms and positions of the teeth, too, are interesting to notice, so invariably are they the index of the economy and the position in nature of the animal.»

In 1859 he published his first paper on the ‹Primary Division of the Salamandridæ.› He became a member of the Academy of Natural Sciences of Philadelphia in 1861. He had had his wish to attend Leidy's lectures, and this same year he spent some time with Gill, Kennicott, Meek and Horatio Wood in the museums of the Smithsonian Institution at Washington. He greatly admired professors Henry, Baird and Arnold Guyot. He was astounded that Guyot believed in the resurrection of the body. He published 6 scientific papers in 1860; 9 in 1861; 13 in 1862; 4 in 1863; 5 in 1864; 10 in 1865; 11 in 1866. These were almost exclusively printed in the *Proceedings* of the Academy of Natural Sciences and were largely on herpetology. In 1866 he became a member of the American Philosophical Society, and thenceforward published largely in this society's proceedings. Altogether, counting his editorials in the *American Naturalist,* and five posthumous publications, his life yielded 1,281 separate papers on scientific subjects. The following statement of his work is taken from Prof. Henry F. Osborn's article in *Science* for 7 May 1897.

As early as 1868 he laid the foundations for five great lines of research on the following subjects: Fishes, Amphibians, Reptiles, Mammalia and Philosophy. He unconsciously followed Lamarck in ascribing to conscious effort the adaptive changes in species, and this at the age of 28. In 1869 he struck the keynote of all his later evolution in the sentence, «Intelligent choice may be regarded as the originator of the fittest, while natural selection is the tribunal to which all the results of accelerated growth are submitted.» He accepted the term Neo-Lamarckian as properly describing his position, which was that, while very many specific characters are adaptive, few generic characters are so, but these latter are the results of the acceleration or retardation of one plan of development preordained by the Creator. As in the case of Huxley, Haeckel and many other naturalists of the last century, his career started in zoology, but led inevitably to palæontology, as it always must with a man of research so broad of view. Osborn says Cope's work in ichthyology would alone have given him high rank among zoologists. Baur says no naturalist ever published so many papers on the taxonomy, morphology and palæontology of the amphibia. His work on the Mammalia and Reptilia was immense. At the time of his death Cope had personally named and described 1,115 out of 3,200 known species of fossil vertebrates of North America, or 34.8 per cent.

He was elected professor of natural science at Haverford College in 1864; was made a member of the National Academy of Science in 1872; received the Bigsby gold medal from the Geological Society of London in 1879; was elected to membership in the Imperial Society of Moscow in 1886; received the degree of Ph.D. from Heidelberg University on the occasion of the celebration of its 500th anniversary, and was elected professor of geology and palæontology at the University of Pennsylvania the same year. In 1891, on motion of Dr. Leidy, he was awarded the Hayden memorial medal. He was president of the American Society of Naturalists in 1895, and president-elect of the American Association for the Advancement of Science at the time of his death. For his titles and those of all of Professor Cope's publications, consult ‹Catalogue chronologique des publications de E. D. Cope, Annales de la société géologique de Belgique t. XXIX Bibliographie, Liége, 1902›; and the ‹Alphabetical Cross Reference Catalogue of the Works of E. D. Cope›; ‹Memorias y Revista de la Sociedad Antonia Alzate,› Mexico 1902; both by Dr. Persifor Frazer.

PERSIFOR FRAZER.

COPE, Henry Frederick, American author, editor and lecturer: b. London, England, 17 June 1870. He was educated at the Government Boy's School, Enfield, the Department of Sciences and Arts, South Kensington, London, and by private tutors. He came to the United States in 1891, studied theology at the Southern Baptist Theological Seminary, and was ordained to the Baptist ministry in 1893. He subsequently held pastorates in Rochester, N. Y., 1894–95; Plano, Ill., 1895–98; and Dillon, Mont., 1898–1903. In 1903 he was engaged in teaching and in special literary work in Chicago. For eight years he was religious editor of the Chicago *Daily Tribune,* and contributed weekly a column to a syndicate embracing the leading daily papers and was on the staff of *The World To-Day, The Sunday School Lines, Service,* the *Country Gentleman,* etc. He became assistant secretary in 1905, and in 1907 general secretary of the Religious Education Society, in which capacity he has visited and spoken in nearly all educational institutions, visiting practically every State in the Union every year. He has been editor of *Religious Education* since its foundation in 1906. He has edited 'Adams Primer on Teaching' (1905); 'The Aims of Religious Education' (1906); 'The Materials of Religious Education' (1907); 'Education and National Character' (1908) and is the author of 'The Bonanza Bible Class' (1904); 'Sunday School Management' (1905); 'Hymns You Ought to Know' (1906); 'The Modern Sunday School in Principle and Practice' (1907); 'Levels of Living' (1908); 'The Friendly Life' (1909); 'The Efficient Laymen' (1910); 'The Evolution of the Sunday School' (1911); 'Efficiency in the Sunday School' (1912); 'Religious Education in the Family' (1915). He received the honorary degree of A.M. from Oberlin College in 1911, and that of D.D. from Washburn College in 1911.

COPE, Sir **John**, English general: d. 28 July 1760. Having been made a knight of the Bath, in 1742 he commanded the troops sent to the assistance of Maria Theresa. On the landing of Prince Charles Edward in 1745, Cope was appointed commander-in-chief of the government forces in Scotland. After a fruitless march to the Highlands, he returned with his troops by sea to Dunbar, and on 21 September was totally defeated at Prestonpans by the Scottish troops under Charles Edward Stuart, the "Young Pretender." His defeat is celebrated in the Jacobite song, 'Hey, Johnnie Cope, are Ye Waukin' Yet?' In 1732 he headed a committee which made a famous report on revenue funds and smuggling.

COPE, Thomas Pym, American merchant: b. Lancaster County, Pa., 26 Aug. 1768; d. Philadelphia, Pa., 22 Nov. 1854. He began importing goods in his own vessels in 1807, and in 1821 established the first line of packets between Philadelphia and Liverpool. He was held in great respect by his fellow-townsmen, who elected him to many places of trust and honor. During the yellow fever epidemic of 1793 he stayed in the city to aid its victims, and during the smallpox outbreak in 1797 carried food to the houses of those taken with the disease, and in other ways cared for them. He was an executor of Stephen Girard's will; secured the estate of Lemon Hill as a park for the city; and was active in the construction of the Pennsylvania Railroad. The introduction of the Philadelphia water supply from the Schuylkill, the completion of the Chesapeake and Delaware Canal, the construction of the Pennsylvania Railroad and the establishment of the Mercantile Library were largely due to his efforts. In 1807, he was elected to the State legislature.

COPE, an article of ecclesiastical vesture in the Roman Catholic Church. It is a voluminous cloak reaching nearly to the feet, opening in front, and with a semi-circular cape or hood behind. It is usually of silk material, embroidered, or of cloth of gold. It is worn by the celebrant in certain functions, as processions and benediction. The cope is not, like the chasuble (q.v.), reserved to priestly use; it is worn also in solemn processions by the clerics who attend the celebrant, and by the cantors in church services. See COSTUME, ECCLESIASTICAL.

COPECK (Russian, "a lance"), a Russian copper coin, so called from the impression of Saint George bearing a lance. It is the oldest form of coin in Russia and superseded furs as a medium of exchange. The coin is the hundredth part of a silver ruble, or about the eightieth part of a paper ruble. It varies in value from three-fifths to three-fourths of a cent. See COINS, FOREIGN, AMERICAN EQUIVALENT OF.

COPELAND, Edwin Bingham, American botanist: b. Monroe, Wis., 30 Sept. 1873. He was graduated at Leland Stanford Junior University in 1895, and also studied at the universities of Leipzig, Halle, Wisconsin and Chicago. In 1897–98 he was assistant professor of botany at Indiana University and held the same position in the University of West Virginia in 1899–1900. In 1901–03 he was instructor in botany at Leland Stanford University, he was botanist to the Philippine government, 1903–08; superintendent of the Philippine Agricultural School 1908–09 and dean of the College of Agriculture and professor of plant physiology in the University of the Philippines since 1909. He has written 'Philippine Agriculture' (1908); 'The Cocoanut' (1914); also some 100 articles on botanical research.

COPENHAGEN ("Merchants' Haven"), Denmark, the capital, situated on the shore of the island of Zealand, in the sound, which is here about 12 miles broad; an outlying portion, Christianshavn, stands at the north end of the island of Amager or Amak, which is separated from Zealand by a narrow arm of the sea. The channel forms a fine large harbor, which is bridged over at two points to connect Christianshavn and the main part of the city. The fortifications on the land side have been removed since 1863; so that the city has now practically incorporated the suburbs Osterbro, Nörrebro, Vesterbro and Frederiksberg and occupying an area of 31 square miles. To counterbalance the expected injury to the city's commerce from the opening of the Baltic Canal, a great free port, free from customs dues, was constructed in 1890–94 to the north of the harbor. The business quarter stretches from the harbor in a northeasterly direction toward the principal and central square, Kongens Nytory, which forms the focus of the life of the city. Farther north and east of this point lies the aristocratic quarter, with the handsome Amalienborg Square and its royal and ministerial palaces; this district is bounded on the extreme north by the citadel and the adjoining public gardens and walks on the shores of the sound.

Among its few buildings of historical interest or intrinsic beauty, the Metropolitan cathedral church, known as Vor Frue Kirke, rebuilt after the bombardment in 1807, possesses statues of Christ and the apostles and a baptismal font, designed and in part executed by Thorwaldsen. Trinitatis-kirke is remarkable for its round tower, which is ascended by a winding causeway instead of steps. Holmens'-kirke contains interesting monuments to the great naval heroes, Juel and Tordenskjöld. An English church, built at a cost of $49,000, was consecrated in 1887. The royal palace, called Christiansborg, was rebuilt between 1794 and 1828, but was never remarkable for architectural beauty. The principal part of the vast building was destroyed by fire in 1884, when many precious works of art were destroyed. Happily most of the pictures in its great art gallery were saved. The castle of Rosenborg (1610-24), where the regalia are kept, contains interesting collections of objects of art; and the palace of Charlottenborg (1624) is now used as an academy of arts. Copenhagen is the centre, not only of Danish, but northern literature and art, and is the seat of a number of societies for the advancement of these in all their branches, among which are the Royal Society, founded in 1742; and the Royal Society of Northern Antiquaries, founded in 1825. A magnificent national theatre was built in 1874. The royal library contains over 600,000 volumes, besides great treasures of Sanskrit and other MSS. The Museum of Northern Antiquities in Prindsens Palais is unrivaled in its kind, having been made what it is mainly by Worsaae. The Thorwaldsen Museum, opened in 1846, consists of works of art by that sculptor himself, and others left by him to the Danish nation, for which a separate building has been erected. There are statues of several of the Danish kings, of Tycho Brahe and of the poets. The city is governed by a body of magistrates nominated by the king, and a municipal council of 42 members. About 50 per cent of the trade of Denmark passes through Copenhagen. The chief exports are grain, rape-seed, butter, cheese, beef, cattle, wool, hides, bones and grain-spirit. Porcelain, pianos, clocks, watches, mathematical instruments, textiles, chemicals, sugar, beer and tobacco are manufactured. Copenhagen is the seat of a United States consul-general.

About the middle of the 12th century Copenhagen was but a fishing village, in the neighborhood of which Bishop Axel, or Absalon, built a castle. In 1254 the village obtained the privileges of a town, and in 1443 King Christopher made it the capital of the kingdom. It was several times attacked by the Hanseatic League; was besieged by the Swedes in the 17th century; was bombarded by the English, Dutch and Swedes in 1700; suffered grievously by fire in 1728, 1794 and 1795; witnessed a great sea-fight in its roads on 2 April 1801, when the English, under Sir Hyde Parker, with Nelson as his second in command, destroyed the Danish fleet; and (to prevent the Danish fleet from falling into the power of Napoleon), was bombarded by the English from the 2nd to the 5th of September 1807, when great destruction was wrought, both in houses and public buildings, and hundreds of persons lost their lives. Pop. with suburbs, 559,398. Consult 'Copenhagen, the Capital of Denmark' (1898); Nielsen, 'Kobenhavns Historie og Beskrivelse' (6 vols., 1887-92).

COPENHAGEN, University of, founded in 1478, by Christian I; destroyed during the civil wars; rebuilt by Christian III in 1539; destroyed by fire in 1728; rebuilt by Christian VI in 1732, and organized as at present in 1788. This is the only university in Denmark and one of the best in the northern part of Europe. It is supported partly by the government and partly by endowment; instruction is free to both sexes. In 1902 there were enrolled 3,000 pupils, and the library contained 400,000 volumes. It possesses also a large collection of Persian MSS., another of Northern MSS. Connected with the university, which has five faculties, are a surgical academy, an observatory, a botanical garden, a zoological museum and a polytechnic institution.

COPEPODA, an order of small Crustacea, characterized by the following aggregate of features: Animal consists of about 16 segments; limbs mostly two-branched; no carapace; development by the addition of new segments behind to a Nauplius larva. Except in the Branchiura, the simple eye of the Nauplius is the definite eye of the adult. Many widely different copepods are parasitic. The Branchiura are ectoparasites on various species of fish. The remaining copepods are divided into the Gymnoplea, in which the division between the front and hind portions of the body falls immediately in front of the genital openings, and behind the fifth thoracic feet, which are modified in the male into a copulatory organ, and the Podoplea, where the boundary falls in front of the fifth thoracic segment. The phosphorescence of the sea is largely due to certain small Gymnoplea. Certain of the Podoplea, forming the family Manstrillidæ, have a very complicated development, for an amorphous parasitic stage intervenes between a free-swimming Nauplius and a likewise free-swimming adult. Consult the article on the Crustacea by Smith and Weldon in volume IV of 'The Cambridge Natural History' (London 1909); the article on the Crustacea by W. T. Calman in Part VII; third fascicle in Sir Ray Lankester's 'A Treatise on Zoology' (London 1909); the article on the Crustacea in volume III of A. Sedgwick's 'A Student's Text-Book of Zoology' (London 1909).

COPERNICAN SYSTEM, The, an epoch-making reversal of man's ideas as to the place of the earth in the universe and the motions of the heavenly bodies, the full details of which were completed by Nicolaus Copernicus, a Polish astronomer, in the year 1530. Prior to the work of Copernicus, it was universally held that our earth is a fixed and immovable body, situated at the centre of the universe, about which all heavenly bodies, including the sun and the fixed star, are in revolution. To account for the apparently complicated motions of the planets, which sometimes are moving eastward among the stars and sometimes are moving westward (or «retrograding»), it had been necessary to suppose that each planet is moving about the circumference of a small circle (called the «Epicycle»), the centre of which pursues a larger circular path about the sun. This older system, devised as early as 140 A.D. by Claudius Ptolemy (q.v.), an Egyptian astronomer, held its place as the true conception of the universe for upward of 14 centuries.

In the Copernican system it was clearly shown that the diurnal motion of the stars (their rising and setting) could be accounted for by assuming that the earth rotates on an axis with a uniform angular velocity, and, further, that the complicated displacements of the planets among the stars could very nearly all be explained by the assumption that the earth and all of the other planets are revolving about the sun in circular orbits of which, however, the sun does not occupy the exact centre. The true paths, however (as we now know), are ellipses, and not exact circles. (See SOLAR SYSTEM). It was therefore necessary for Copernicus to retain in his system a few small

«Epicycles» to account for certain small outstanding disagreements between the predicated and the observed motions.

So complete an overturning of man's conception of the place and importance of the earth naturally by no means met with immediate acceptance. It was, in fact, fully a century after the death of Copernicus (in 1543), before the reasonableness and simplicity of the new theory finally overcame the older, very artificial and complicated system of Ptolemy. At the present time many direct observational proofs are available that the earth is revolving about the sun (see PARALLAX, ABERRATION, The DOPPLER PRINCIPLE, etc.), so that the essential truth of the Copernican theory is no longer open to question.

COPERNICUS, or KOPPERNIGK, Nicolaus, Polish astronomer: b. Thorn, Poland, 19 Feb. 1473; d. Frauenburg, East Prussia, 24 May 1543. His father was a Pole and his mother a German. From a school at Thorn Copernicus went to Cracow, where he studied medicine, theology, mathematics and astronomy. The fame of Peurbach and Regiomontanus, the restorers of astronomy in Europe, excited his emulation. In 1496, at the age of 23, he went to Italy, and at Bologna resided two years, studying canon law and astronomy. In 1497, while in Italy, he was appointed a canon of the cathedral of Frauenburg. In 1500 he went to Rome, where he lectured on mathematics and astronomy. Subsequently he studied medicine at Padua, and canon law at Ferrara, where he graduated as doctor in this subject. He returned to Prussia in 1505, and lived for some years at Heilsberg, but his subsequent life was mostly spent at Frauenburg.

He now applied his whole strength to the study of astronomy, which at this time was dominated by the system of Claudius Ptolemy. Copernicus doubted whether the motions of the heavenly bodies could be so confused and so complicated as this hypothesis would make them. He found that some of the ancient Greeks had thought of the possibility of a motion of the earth. This induced him to examine the subject more fully, and he came to the following conclusions: That the sun was the centre of the system; that the earth was a planet like Mars and Venus; and that all the planets revolve round the sun in the following order: Mercury in 87 days, Venus in 224, the Earth in 365, Mars in one year and 321 days, Jupiter in 11 years and Saturn in 29 years. Although Copernicus knew that the planetary orbits are not circles having the sun in the centre, he was not able to determine exactly their form. This was reserved for Kepler, who completed what may be called the natural history of the subject, and stated his three celebrated laws in the end of the 16th century. Thus Copernicus stands, as it were, upon the boundary-line of a new era. He commences his labors at a time when the belief in the immobility of the earth is universal. He conceives the idea of its motion, and pursues it with unwearied diligence, not for a few years, but through the greater part of his life, constantly comparing it with the appearances in the heavens. He at last confirms his idea, and thus becomes the founder of a new system of astronomy. All this he did a hundred years before the invention of telescopes, with imperfect wooden instruments on which the lines were often only marked with ink. His great countryman, Kepler, has described his character in the following words: «Copernicus, vir maximo ingenio, et quod in hoc exercitio magni momenti est, animo liber.» In his celebrated work, dedicated to the Pope, Paul III, 'De Orbium cœlestium Revolutionibus,' libro vi (completed in 1530, although first published at Nuremberg 1543, folio; later editions appeared at Basel 1566, at Amsterdam 1617, at Warsaw in 1851, at Berlin in 1873), his system is developed.

Besides his principal work, we have also by him a work on trigonometry, 'De Lateribus et Angulis Triangulorum.' The first biography of Copernicus was written by the mathematician Gassendi (1654), and for 200 years this work served as the basis of all subsequent biographies of the great astronomer; but in more recent times the labors of Prowe and others have helped us to a better acquaintance with the facts of his life. Count Sierakowski erected a monument to his memory in Saint Anne's Church at Cracow, with this inscription: «Sta, sol, ne moveare» (Stand, Sun, do not move). Thorwaldsen, one of the greatest sculptors of our time, executed a colossal statue of Copernicus for the city of Cracow, which is one of the noblest specimens of modern art. Another statue of him by F. Tieck has been erected in his native town. Consult Bertrand, 'Les foundateurs de l'astronomie moderne' (Paris 1865); Bryant, 'History of Astronomy' (London 1907); Curtze, 'Nicolaus Copernicus' (Berlin 1899); Czynski, 'Kopernik et ses travaux' (Paris 1847); Flammarion, 'Vie de Copernic' (ib. 1872); Gassendi, 'Vita Nicolai Copernici' (The Hague 1652); Muller, 'Nikolaus Copernicus, der Altmeister der neueren Astronomie' (Freiburg 1898); Prowe, 'Nicolaus Copernicus' (3 vols., Berlin 1884), the standard biography; Wolf, 'Geschichte der Astronomie' (Munich 1877); id., 'Handbuch der Astronomie, ihrer Geschichte und Litteratur' (2 vols., Zürich 1893).

COPHA, a racially and linguistically distinct Indian family which formerly occupied extensive territory in California from far south to Mount Shasta in the north. The Copehan language was well developed and harmonious; but their political and social systems were little, if any, in advance of those of the other Indian races of California. There was considerable difference between the language (dialectically) and customs of the Cophas of the south and those of the north of California. Even the people of the 20 or more important villages of Cophas differed dialectically. There were two distinct branches of the Cophas or Copehan family, known as the Patwin and the Wintun. The Government Agricultural Commission appointed in the fifties to adjust the claims of the Indians and Mexicans overlooked a small section of the Cophas then living on what is now known as Warner's Ranch near Los Angeles, in southern California, and their lands were sold without a hearing. They refused to leave their home, but in May 1901 the Supreme Court confirmed the rights of the white claimants. In May 1903 they were moved by the government to a fertile tract of land in the Valley of Pala, on the San Luis Rey, where they were subsequently joined by other members of the tribe.

COPHETUA, an African king of legend and ballad verse who married the beggar maid, Penelophon. Shakespeare in alluding to Cophetua calls the maid Zenelophon. There is a well-known poem by Tennyson on the subject, called the 'Beggar Maid,' and the story is also told in Percy's 'Reliques.'

COPIAPO, kō-pē-ā-pō′, or **SAN FRANCISCO DE LA SELVA**, Chile, the capital of the province of Atacama, centre of an important mining district containing machine shops and smelting works. Silver and copper are the chief minerals obtained, but gold also is found. There is a railway connecting it with its port, Caldera. In 1819 and 1822 it was destroyed by earthquakes; and in 1851 it was again seriously damaged. The principal points of interest are the parish church; a bronze statue of Juan Godoy, the discoverer of the Chañarcillo silver mines; and also a provincial high school, a mining school and a public library. Pop. about 12,000.

COPLAS DE MANRIQUE, kōp′las dę măn-rēk′ē. This is the modest title of an elegiac poem by Jorge Manrique (1440–79), generally considered the most eminently successful of the Spanish lyric poets of the 15th century. This success is due to the *coplas*, the more distinctive title of which is 'Coplas de Manrique por la muerte de su padre' («Manrique's Couplets on the death of his father»). The elegy consists of about 500 lines divided into 42 *coplas*, or stanzas, in the old Spanish measure and manner, called *redondillas con quebrados* (quatrains with a short line in every third place). The poem was first published in 1492, 16 years after it was written, when Manrique's father, the Maestro de Santiago, died (1476), in whose honor it was composed. Spanish devotional poetry contains many exquisite gems, and the coplas are rightly placed among them. Grief for the death of his father has brought to the poet's mental vision a vista of the spiritual world, and a realization of the vanity of material things. The impression of many of the lines is ineffaceable. In 1833 appeared the remarkably fine English rendering by Longfellow, in which the versification, spirit and even wording of the original are followed as closely as possible. Besides its inherent charm, Manrique's poem is noteworthy in its independence of the three dominating poetic influences of the day, the artificial court verse, the Italian influence and that of the Renaissance.

There have been many editions of the Spanish text of the poem since the 1492 edition, notably the Madrid edition of 1799 with a gloss, contained in 'Proverbios de don Iñigo López de Mendoza, Marqués de Santillana, y las coplas de don Jorge Manrique, todo con sus glosas, por D. Fermin Villapando'; the critical edition published by R. Foulché Delbosc (Madrid 1902; Vol. XI of the 'Biblioteca hispanica'); also translations into foreign languages and commented versions. Many, if not all, of the coplas appear in annotated anthologies. (Cf. J. D. M. Ford's 'A Spanish Anthology,' Boston 1901, pp. 43–59). The entire text of the poem will be found in 'Antología de poetas líricos castellanos ordenada por D. Marcelino Menéndez y Pelayo' (Vol. III, pp. 100–116, Madrid 1892); and the greater part of Manrique's verse appears in the important 'Cancionero general' (1511).

James Geddes, Jr.

COPLEY, John Singleton, American painter: b. Boston, Mass., 3 July 1737; d. London, England, 9 Sept. 1815. He was of Irish parentage and received his early training in engraving from his stepfather, Peter Pelham, a mezzotint engraver. In painting he was practically self-taught. His talent for drawing developed at an early age, and in 1760 he sent anonymously to Benjamin West in England a portrait called 'The Boy and the Flying Squirrel,' which, when exhibited, was highly praised by the best English artists of the time. In 1769 he married the daughter of a wealthy Boston merchant, and became the recognized painter of Boston society. In 1774 he sailed for England, visited Italy and settled in London, where he rose rapidly in popularity as a portrait painter, within a few years being elected an associate member and full member of the Royal Academy. Some of his most celebrated paintings are portraits of the English royal family; the 'Death of Lord Chatham,' now in the London National Gallery; 'Siege and Relief of Gibraltar,' in the council chamber of the Guildhall; 'Major Pierson's Death on the Isle of Jersey'; 'Surrender of Admiral De Winter to Lord Duncan'; 'Charles I Demanding the Five Impeached Members in the House of Commons'; 'The Red Cross Knight'; 'Mrs. Derby as Saint Cecilia.' His principal American portraits are those of Samuel Adams and John Hancock, in the Boston Art Museum; Mrs. Ford, in the Boston Athenæum; Mrs. Thomas Boylston and others, in Harvard Memorial Hall; Lady Wentworth and Mrs. Robert Harper, in the New York Public Library; Robert Izard and his wife, painted in Rome, now in the Boston Art Museum; the Copley Family and John Quincy Adams, in the Boston Art Museum. His son, Lord Chancellor Lyndhurst, made a notable collection of his father's works, which was dispersed at public sale in 1864. Consult Perkins, 'Life of J. S. Copley' (Boston 1873); Amory, 'Life of J. S. Copley' (Boston 1882); Isham, 'History of American Painting' (New York 1905).

COPLEY, John Singleton (1772–1863). See Lyndhurst, Baron.

COPPÉE, kŏp-pā, **François Édouard Joachim**, French poet and dramatist: b. Paris, 12 Jan. 1842; d. Paris, 23 May 1908. He was librarian of the Senate, and keeper of the records at the Comédie Française 1878–84. He became a member of the French Academy in 1884, and an officer of the Legion of Honor in 1888. From 1880 to 1884 he was the dramatic critic of *La Patrie*. Coppée was an accomplished artist and a skilled craftsman, although a trifle affected. His verse lacks true inspiration, but may be characterized as finished poetical prose. He is par excellence the poet of the humble classes. Chief among his plays are 'Le passant' (1869); 'Fais ce que tu dois' (1871); 'Le luthier de Crémone' (1877); 'La guerre de cent ans' (with d'Artois) (1878); 'Madame de Maintenon' (1881); 'Severo Torelli' (1883); 'Les Jacobites' (1885). An edition of his dramas in four volumes appeared (1873–86). Among his poems may be named ‹Les intimités› (1868); ‹Poèmes modernes› (1869); ‹Une idylle pendant le siège› (1875); ‹L'exilée› (1876); ‹Lesmois› (1877); ‹Le naufrage› (1878). He has also published short stories including ‹Le coupable› (1896), and ‹La bonne souffrance› (1900) and a collection of essays ‹Mon franc parler› (1894). Consult Lescure, ‹F. Coppée, l'homme, la vie et l'œuvre› (Paris 1889); Gaubert, ‹François Coppée› (ib. 1906); Druilhet, ‹Un poète français: François Coppée,› (Paris 1902); Delmont, ‹Trois illustres conquêtes de la foi: Coppée, Brunetière, Bourget› (1905).

COPPENS, Charles, American clergyman and educator: b. Turnhout, Belgium, 24 May 1835. He was educated at the Jesuit College, Turnhout, and the Jesuit scholasticates at Saint Louis, Mo., and Fordham, N. Y. In 1853 he entered the Society of Jesus, was ordained to the priesthood in 1865, and at various times was professor of the classical languages, of philosophy and the history of philosophy in the Jesuit colleges at Saint Louis, Cincinnati, Detroit, Omaha and Chicago. From 1881 to 1884 he was president of Saint Mary's College, Kansas, and in 1908 was appointed professor of literature at Saint Ignatius College (now Loyola University), Chicago. He is the author of ‹Introduction to English Rhetoric› (1885); ‹Oratorical Composition› (1886); ‹Logic and Metaphysics› (1892); ‹Moral Philosophy› (1896); ‹Moral Principles and Medical Practice› (1898); ‹The Living Church of the Living God› (1902); ‹Systematic Study of the Catholic Religion› (1903); ‹Protestantism, How it was Brought About› (1907); ‹A Brief History of Philosophy› (1909); ‹Who are the Jesuits?› (1911). He is a contributor to ‹The Catholic Encyclopedia,› the *American Ecclesiastical Review* and various Catholic journals.

COPPER, a butterfly of the genus *Chrysophanus* of the family *Lycænidæ*. They are small, have the upper side of the wings some tint of copper-red or orange, frequently glossed with purple; the under side of the wings is marked with small spots and lines. The caterpillars are slug-shaped, thickest in the middle and with small heads. The genus is distributed over the temperate regions of both continents, 13 species inhabiting North America.

COPPER, a metallic element occurring abundantly in nature, and widely used in the arts, both in the pure state, and as an essential constituent of many alloys. It has been known from the earliest times, and is frequently mentioned by the ancient writers. Prehistoric weapons, tools and ornaments of copper, as well as domestic implements, remain in profusion to this day; and it has been commonly asserted that copper was known and used before iron, though some authorities consider the evidence of this to be inconclusive. The Romans obtained their best copper from Cyprus, an island in the Mediterranean Sea, and for this reason the metal was known as *Cyprium æs,* or «Cyprian brass,» a name that was later contracted to *cuprum* and *cuper.*

Physical Properties.— Copper is red in color, and crystallizes in cubes, octahedra and other forms of the isometric system, twinned crystals being quite common. When in a finely divided condition it has a specific gravity of about 8.36; but the specific gravity of native copper is 8.84, and that of hammered or electrically deposited copper is about 8.95. It melts at about 2000° F., and has a specific heat of about 0.093, and a coefficient of linear expansion of about 0.0000092, per Fahrenheit degree. Its tensile strength varies greatly, according to the physical condition of the metal. The following data are commonly used in engineering practice, as corresponding to the tensile strength in pounds, per square inch of sectional area: Cast copper, 19,000; sheet copper, 30,000; copper bolts, 36,000; copper wire, 60,000. The thermal conductivity of copper, at ordinary temperatures, is about 0.74 times that of silver. The specific electrical resistance of hard-drawn copper is 1,620 ohms, and that of annealed copper is 1,584 ohms. A wire of the metal that is one metre long and one millimeter in diameter has a resistance of 0.0206 ohms if hard drawn, and 0.202 if annealed. These data are for the pure metal, at the temperature of freezing water. The electrical resistance of copper increases by about 0.388 of 1 per cent for each Centigrade degree of rise of temperature. The electrical resistance is also greatly increased by the presence of small percentages of iron, zinc, tin, phosphorus or arsenic, and hence great attention is paid to the purity of the copper that is intended for use in electrical conductors. Copper is very malleable and ductile, and may be drawn into small wire and hammered into exceedingly thin sheets. An alloy consisting of 11 parts of copper and 2 of zinc is even more malleable than copper itself, and may be hammered into foil comparable in appearance with gold-leaf, for which it is used as a substitute in certain kinds of work, under the name of «Dutch metal.» Copper becomes very soft and malleable when it is strongly heated and immediately immersed in cold water, its behavior under these circumstances being diametrically opposed to that of steel. It may be forged into any shape, but it will not bear more than a red heat, since it becomes brittle at higher temperatures. It does not oxidize readily under ordinary conditions, but becomes superficially tarnished with a coating of carbonate that resists the subsequent action of the oxygen of the air. Copper often gives poor castings, apparently because the molten metal absorbs gases, and these, when given off again at the moment of solidification, make the casting porous. The castings are said to be much more sound when a small quantity of phosphorus is added to the molten metal — usually in the form of phosphor-copper. The large copper cylinders that are used in calico-printing are cast in molds, and are subsequently hammered under a steam-hammer until the metal is sound, and then turned down in a lathe until the surface is true and free from defects.

Alloys.— Many alloys of copper are used in the arts, chiefly under the name of «brasses» or «bronzes.» Originally a brass was defined as an alloy of copper and zinc, while a bronze was defined as an alloy of copper and tin. This convention is still retained in a general way, but the same names are applied also, and very commonly, to numerous ternary alloys, containing copper, zinc and tin, which pass by insensible gradations from a true brass to a true bronze; so that «brass» and «bronze» can no longer be regarded as very definite terms. Alloys of copper with aluminum are called "bronzes," even when no tin is present. See ALLOYS; BRASS; BRONZE.

Chemistry.— The chemical symbol for copper is Cu (*cuprum*), and the atomic weight of the metal is 63.1 if $H = 1$, and 63.6 if $O = 16$. Performs two distinct series of salts, known respectively as "cuprous" and "cupric" compounds. In the cupric series the metal is a dyad, while in the cuprous series it enters into the ordinary formulæ as though it were a monad. (See CHEMISTRY). Structural formulæ have been given, however, which indicate that the metal is really a dyad in both cases. The cupric series of salts embraces those compounds that are most familiar in the arts. Cupric oxide (known also as copper monoxide, or black oxide) is formed when metallic copper is heated in the presence of air. It may occur as a brownish-black amorphous powder, or in lustrous monoclinic crystals. Cupric oxide is used in the laboratory for effecting the combustion of organic substances, the oxide being intimately mixed with the body to be oxidized, and the whole raised to a red heat, at which temperature the cupric oxide readily gives up its oxygen to either hydrogen or carbon. Cupric oxide (the formula of which is CuO) is soluble in acids, and yields, with them, salts which crystallize well. If a solution of any of these salts be made alkaline by the addition of a caustic alkali, a light blue precipitate of cupric hydrate, $Cu(OH)_2$, is thrown down. Upon heating to 212° F., this parts with a molecule of water and becomes reduced to the black oxide, CuO. If cupric hydrate be precipitated by adding the calculated quantity of sodium hydrate to a solution of copper sulphate, and the precipitate is mashed and dissolved in ammonium hydrate, a blue solution is obtained, which is sometimes called "cupro-ammonium hydroxin," and which possesses the singular power of dissolving cellulose (q.v.) without chemical change. When pure cupric oxide is desired, it is most conveniently prepared by heating cupric nitrate to redness. Cupric nitrate is readily prepared by dissolving metallic copper in nitric acid. It crystallizes in large blue prisms, having the composition $Cu(NO_3)_2 + 6H_2O$. Ordinary copper sulphate (cupric sulphate, or "blue vitriol") is manufactured in large quantities by dissolving scales of copper oxide (CuO) in sulphuric acid. It forms large blue triclinic crystals, which have the composition $CuSO_4 + 5H_2O$. The sulphate is used in calico-printing, and in the manufacture of various copper pigments such as Brunswick green and Scheele's green. Cupric chloride, $CuCl_2$, is formed by dissolving cupric oxide in hydrochloric acid, or by acting upon metallic copper by chlorine gas. It is soluble in alcohol or water, and forms acicular crystals having the formula $CuCl_2 + 2H_2O$. Cupric sulphide, CuS, is the familiar black precipitate that is obtained when sulphuretted hydrogen gas is passed through an acid solution of a copper salt. (See CHEMICAL ANALYSIS). Copper carbonate, $CuCO_3$, has not been prepared in the pure state, but a green precipitate having the formula $CuCO_3 + Cu(OH)_2$ is thrown down when carbonate of potassium or of sodium is added to a solution of a copper salt; this precipitate being identical in composition with the mineral malachite. Cuprous oxide, Cu_2O, or red oxide of copper, occurs native in red octahedral crystals, and it may also be prepared artificially by heating a mixture composed of equivalent parts of cupric oxide and finely divided metallic copper, or (more conveniently) by heating a mixture of equal parts of cupric oxide and ammonium carbonate, $(NH_4)_2CO_3$, over a Bunsen burner, until all the ammonia is expelled. It is a crystalline powder of a carmine color, melting at a strong red heat, and is used in glass manufacture for the production of a ruby color. The precipitation of this oxide from certain test-solutions is used as a test for the presence of sugar in urine. (See URINARY ANALYSIS). Cuprous oxide dissolves in various acids with the production of colorless salts, which are unstable, since they readily absorb oxygen and pass into the corresponding cupric salts. The most important cuprous salt is the chloride, which has the formula Cu_2Cl_2, and is formed by heating metallic copper to dull redness in a current of hydrochloric acid gas, or by dissolving a mixture of cupric oxide and metallic copper in hot hydrochloric acid. It is a white crystalline powder, insoluble in water or alcohol, or in dilute nitric or sulphuric acids, but dissolving in ammonia, or in hot hydrochloric acid. Its solution in either of these menstrua possesses the remarkable property of absorbing carbon monoxide gas. Copper may be detected in solution (1) by the formation of the black sulphide when a stream of sulphuretted hydrogen gas is passed through the acidified solution; (2) by the precipitation of the blue hydroxide, which blackens upon heating; (3) by the deep blue color that its salts give upon the addition of ammonia; and (4) by the precipitation of a red film of metallic copper when a clean, bright fragment of iron is immersed in the solution.

Physiological Action.—In medicine, salts of copper are used as astringents and as antiseptics, copper sulphate being the favorite salt. The soluble salts of copper are all exceedingly poisonous, and since the metal is very widely used in the arts, copper poisoning is quite common. In acute poisoning the symptoms are those of an acute gastro-intestinal irritant. These usually develop in from 10 to 20 minutes, though they may be delayed as much as two or three hours. There is nausea and vomiting of bluish material, accompanied by a metallic taste in the mouth, and intense burning in the stomach, with great abdominal tenderness. If all the copper is ejected by the emesis, the patient usually recovers. This is usually the case, but sometimes, when the dose is extremely large, vomiting is ineffectual. In addition to the symptoms already given, intense headache then develops, accompanied by great prostration and cramps, with small, rapid pulse and collapse; death sometimes following in from 4 to 12 hours, but more commonly after two to four days or more.

Ores and Occurrence.— Native copper occurs in nature, and in the Lake Superior district (Michigan), forms the chief ore. Chalcocite (Cu_2S), chalcopyrite ($CuFeS_2$), bornite (Cu_3FeS_3), enargite (Cu_3AsS_4), covellite (CuS), tetrahedrite ($Cu_8Sb_2S_7$), azurite [$2CuCO_3.Cu(OH)_2$], malachite [$CuCO_3.Cu(OH)_2$], chrysacolla ($CuSiO_3.2H_2O$) and cuprite (Cu_2O), are all important ores.

Practically all our important copper deposits are the result of heated waters related to volcanic activity. Typical contact metamorphic deposits are found in the Clifton-Morenci district of Arizona and in the limestone deposits of Bingham, Utah. Bisbee, Ariz., and Ely, Nev., are also classed with this type. The Butte, Mont., ores are typical vein deposits formed by hot waters. Globe, Bisbee and Clifton-Morenci all show typical replacement deposits in limestone. The Bingham camp in Utah is now noted for its enormous bodies of low grade disseminated ore in porphyry. The Globe, Miami and Ray districts of Arizona contain great disseminated deposits in Pre-Cambrian schists. The Lake Superior ores are chiefly native copper, occurring in the vesicular openings (amygdules) of lava flows, or replacing interbedded layers of conglomerate. As indicated above, one district may show several types of ore deposit. See ORE DEPOSITS.

The greatest copper producing locality in the United States, and therefore in the world, is the Butte district of Montana. The copper veins are confined to a comparatively small area lying north of Silverbow Creek, about two miles in length and one and one-half miles in width. Several of the mines now producing copper were opened as silver mines, the silver being replaced by copper at the depth of about 150 feet. This locality produced in 1916 349,500,000 pounds of copper, equivalent to 17.42 per cent of the entire output of the country. Inclusive of this amount the total production of this region since it was opened in 1868 has been 7,030,000,000 pounds — an output larger by more than 1,000,000,000 pounds than any other copper-yielding region known. The ore most common in this region, and which has supplied 75 per cent of the entire output, is chalcocite, or copper glance — a sulphide, carrying 79.8 per cent of metallic copper. This ore was originally pyrite, and has been altered by hot descending waters containing copper sulphate. About 20 per cent of the Butte copper production has been from enargite, a sulpharsenate of copper, carrying 48.67 per cent of the metal. About 4 per cent has been recovered from bornite, an altered chalcocite, carrying 63.3 per cent of copper. The remainder has been gained from covellite, chalcopyrite and tetrahedrite.

Two other localities in the United States are eminent as producers of copper: the Keweenaw (Lake Superior) district of Michigan and the Bisbee district of Arizona. The former has a record of 6,029,777,236 pounds since its first production in 1845, practically all recovered as native copper. The Bisbee district began production in 1880, and its record stands at 2,219,556,000 pounds. Four other districts in Arizona have contributed to swell the grand total for the State to 5,767,698,935 pounds since the first mine within its borders was opened in 1873. The ores of Arizona are virtually the same as in Montana, the upper earth section being barren through having its copper leached away for a depth of about 250 feet and deposited in the veins of the 100-foot zone below. Chalcocite is the principal ore, altered in places to chalcopyrite, bornite, covellite and melaconite.

Smelting and Refining.— Mining the ore is but the preliminary step in the production of commercial copper. The crude ores must be smelted and the smelter product refined. The first treatment the ore receives after being raised is concentration. This is a mechanical treatment with the object of eliminating as much as possible of the gangue or non-ore-bearing rock accompanying the ore. It makes use of the methods of hand-picking, wet and dry jigging tables and hydraulic separation. The ore then goes to the smelter.

The particular smelting process employed depends on the chemical constitution of the ore: that is, whether it is a sulphide, an oxide or native copper. With the sulphide ore the first operation is roasting, in order to oxidize the sulphur and iron present, and to volatilize the arsenic, bismuth and antimony. The roasted ore is then reduced in a blast furnace with anthracite coal, the product of this state being known as «matte.» This is again roasted and again passed through the blast furnace, the product being the impure copper known as «black copper.» Oxide ore is reduced by mixing it with sulphide and then smelting it for matte, as explained above. Native copper ore is smelted with anthracite and coke in a reverberatory furnace, with or without the addition of limestone flux. The product is crude metallic copper, which is often tapped directly into the refining furnace.

The metallic copper of various forms as it comes from the reducing furnaces contains as impurities some if not all of the following named minerals: iron, nickel, cobalt, lead, zinc, tin, arsenic, antimony, bismuth, sulphur, selenium and tellurium, besides a percentage of silver and gold. The object of the refining process is to remove to the utmost practicable limit all of these substances, and to turn out the metallic copper at least 99.8 per cent pure. The process of fire-refining is essentially an oxidizing process. It is, however, conducted at a degree of heat so high that such metallic impurities as arsenic, antimony and bismuth are volatilized. The other metals present are oxidized into dross and removed with the slag. The cuprous oxide (C_2O) held in solution in the metal, the only oxide of copper which is stable at the melting point of copper, is gradually reduced until only about one-half of 1 per cent remains, and this is left in the metal to make certain that no other metallic impurities are present except in the form of harmless oxides. The furnace used in fire-refining is of the reverberatory type. The more impure the metal the longer the treatment and the smaller the quantity which can be worked at one time. The «charge» of solid copper, in the form of cakes, is placed in the furnace basin by hand or by mechanical appliances, and the first or melting fire is set in the fire-box. If the copper is relatively pure it melts quickly; if impure «black» copper, it is much slower and may be hastened with an air blast. When the melting is complete the fire is drawn and a new, oxidizing fire built. As the slag forms it is constantly skimmed away and the clear metal exposed. Cuprous oxide is formed on the clear surface and is dissolved in the molten metal. The metallic impurities which have a stronger affinity for oxygen than has copper take up oxygen from the cuprous oxide and rise to the surface as slag. This operation is forwarded by forcing air into the molten metal through iron pipes dipping well down below the surface. These pipes melt off in the great heat, but the iron is oxidized and rises to form part of the slag.

When the slag ceases to form, the melted copper retains about 6 per cent of cuprous oxide in solution. This proportion of cuprous oxide is reduced by the process of "poling," which consists of forcing poles of green timber, butt end first, into the mass of melted copper, and feeding them in as they burn away. A state of ebullition is excited by the vapors arising from the scorching wood: the carbonic oxide and hydrogen set free seize upon the oxygen of the cuprous oxide and the charcoal aids in the reduction. This operation is continued until a microscopic examination determines that the cuprous oxide is reduced to the correct proportion — from .5 to .7 per cent. If the poling is carried too far the other impurities give up their oxygen and resume their metallic state, and the entire mass of the copper has to be reoxidized to the 6 per cent content, and the poling done over again. When the copper has reached the proper constitution it is cast into ingots, ingot-bars, wire-bars or cakes.

The electrolytic method of refining copper is generally preferred in the United States, and nearly three-fourths of the country's product is thus refined. This process is essentially electroplating. The anodes are of cast copper, about three feet square and one inch thick and weighing 475 pounds each. The cathodes are of pure electro-deposited copper, a little longer and wider than the anodes, and about one-sixteenth of an inch thick. The anodes are placed in the tank at from three to five inches apart; the longer distance for the more impure metal. A cathode is hung between each of two anodes and one at each end of the tank. The tanks are built of timber and lined with lead. They are two inches wider than the cathodes, allowing an inch of free electrolyte at each side. The tanks are usually about 10 feet long and hold from 20 to 30 pairs of anodes and cathodes, connected usually in multiple. Some few of the largest works, however, connect them in series. The electrolyte is a solution of copper sulphate in the proportion of 12 per cent, and acidulated with about 9 per cent of sulphuric acid. The copper content is held up to at least 3 per cent to prevent plating with arsenic where it is presented in the anode. The free sulphuric acid in the bath is limited to 12 per cent to avoid decomposition. The temperature of the electrolyte is held between 105° and 140° F. by means of steam coils. A continuous circulation of the electrolyte is necessary to prevent irregular deposition. The current ranges from 12 to 34 amperes per square foot of anode. The lower figures are adopted where arsenic is present. The voltage varies in different plants from 60 to 180. The time required to deposit the pure metal from the anode is about 20 days.

In 1916 there were active in the United States 13 refineries, nine of which employed the electrolytic method and five the furnace process on Lake Superior copper — one employing both methods. Their combined output for the year was 2,259,387,315 pounds, of which 1,950,255,629 pounds were electrolytic; 269,794,531 pounds were Lake, and 39,337,155 pounds were casting and pig copper. Of the total refined product about 370,000,000 pounds were of foreign origin. In addition to this primary copper, the refineries handled secondary copper, producing from this source 78,585,296 pounds of electrolytic and 25,838,511 pounds of casting copper. A part of this also was foreign. Besides this output of metal the refineries also produced 55,622,345 pounds of blue vitriol, equivalent to 14,043,315 pounds of metallic copper.

Secondary Copper is the name given to the copper recovered by smelters and refineries from scrap metals, sweepings, skimmings and dross, as distinguished from the primary copper derived directly from ores. The production of secondary copper in the United States in 1916 was unprecedented, very large quantities of scrap from rolling mills and munition works finding their way to the secondary smelters. The record for the year shows a total of 140,000 short tons of copper and copper in alloys (exclusive of brass), and 300,000 short tons of brass containing about 70 per cent of copper, or about 210,000 tons — a grand total of 350,000 tons, valued at $196,320,000.

Commercial Copper.— In the American markets copper appears in three grades: electrolytic, Lake and casting copper. Both electrolytic and Lake grades test at least 99.8 pure. Electrolytic copper has a slightly higher degree of conductivity than Lake copper and greater endurance in bending and twisting tests, and is therefore preferred for electrical work. Casting copper is a fire-refined blister copper, testing sometimes as low as 98.5 per cent pure. It is unsuitable for electrical purposes or for making brass wire and sheet brass, but is available for making copper or brass castings. The principal forms in which copper is marketed are ingots about 3 by 3 by 9 inches, weighing about 17 pounds; ingot-bars, about 3 by 3 by 27 inches, weighing about 50 pounds; wire-bars, about 3½ by 3½ by 33 and up to 60 inches, and weighing from 85 to 250 pounds; and cakes, in round or square forms, ranging in diameter from 8 to 39 inches, and 14 by 17 inches up to 42 inches square, and from 1½ to 8 inches in thickness. About one-third of the entire copper product of the country is used in making wire and electrical supplies and one-fourth in making brass.

Production.— The world's smelter production of copper for the year 1916 amounted to 3,106,995,660 pounds (estimated in part), an increase of more than 31 per cent over the production of 1915, and almost exactly double the production of 1906. Of the grand total, the United States smelters produced 1,927,850,548 pounds (62 per cent); Japan, 179,189,888 pounds (5.8 per cent); Chile, 157,474,578 pounds (5.1 per cent); Canada, 119,770,814 pounds (3.8 per cent); Mexico, 111,625,577 pounds (3.6 per cent); Spain and Portugal, 110,230,000 pounds (3.6 per cent).

In the United States the mine production in 1916 was 57,863,365 tons of copper ore, containing 2,005,875,312 pounds of metallic copper — an average of nearly 35 pounds per ton of ore. Not all of this was recovered (in 1916) by the smelters, and this accounts for the variance with the figures given above for the United States under the world's production. In 1,011 mines copper was the principal product, and these mines produced a total of 1,977,724,784 pounds. In 837 other mines copper was recovered as a by-product to the amount of 28,150,528 pounds.

Among the States, Arizona maintained first rank with the unprecedented output of 721,833,169 pounds, more than 36 per cent of the output of the whole country, and an increase of 60 per cent over her record yield of 1915. Montana held second rank, with 352,928,373 pounds. Michigan was third with 273,692,525 pounds; Utah fourth, with 240,275,222 pounds; Alaska fifth, with 119,854,839 pounds, and Nevada sixth, with 105,116,813 pounds. These five States with Alaska produced 93 per cent of the total copper output of the United States in 1916. The price of copper for the year averaged 24.58 cents per pound — as compared with 17.50 cents in 1915. The total value of the country's production was $474,288,000.

Imports and Exports.— In 1916 the United States imported a total of 462,335,980 pounds of copper, of which 268,927,315 pounds was in unrefined blocks, bars and pigs; 9,451,388 pounds in clippings and old metal and 8,411,230 pounds in refined plates, bars and rods. The remainder was the calculated copper content of ores (124,878,905 pounds), concentrates (32,753,874 pounds), and matte and regulus (17,155,075 pounds), brought in to be smelted and refined. These importations came chiefly from Chile (121,342,981 pounds), Mexico (95,916,592 pounds), Canada (91,110,410 pounds), and Peru (77,672,763 pounds). The exports amounted to 789,791,254 pounds, valued at $231,915,832. Of the whole, 336,829,464 pounds went to France; 184,564,740 pounds to the United Kingdom, and 113,764,478 pounds to Italy.

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RICHARD FERRIS,
Editorial Staff of The Americana.

COPPER, Discovery and Development. Copper in a metallic form occurs, either alone or in connection with chemical combinations of the same metal, in many parts of the earth, notably in Peru, Chile and neighboring countries, in Alaska, in parts of South Australia and more sparingly in Siberia, in Cornwall, in Germany, in several of the United States and elsewhere. In few localities has it been found in quantities as large, or under circumstances as favorable for large mining operations, as in the Lake Superior region. The attention of the early navigators to America, next to the finding of a northwest passage to Asia, was directed to the natural resources of the New World, and especially to its deposits of valuable minerals.

Of early references to copper in North America that of Verrazzano in 1524 is among the first. He saw, on the coast of New England, beadstones of that metal in the ears of the natives. In 1535 Jacques Cartier, on his second voyage to the Saint Lawrence River, was told by the Indians that native copper — *cuyvre rouge* — by them called "caignetdaze," came from the Northwest, from the region known to them as Saguenay, and they gave to their chief, Donnacona, when he sailed for France with Cartier, a large knife of that metal.

In 1610, Champlain, on one of his excursions up the Saint Lawrence, is said to have been given a piece of copper a foot long, that was reported to have come from the bank of a river near a great lake. "The Indians asserted that it was gathered in lumps, and, after having melted it, they spread it in sheets, smoothing it with stones."

On Champlain's map of 1632 we find in a lake northwest of Lake Huron an island marked "where there is a mine of copper." This might have been either Michipicoten Island or Isle Royale.

Sagard, who published his ‘History of Canada’ in 1636, wrote that Bruslé, one of Champlain's interpreters, showed him a "lingot" of copper which had come from a mine 80 or 100 leagues from the Hurons.

In 1660 Pierre Esprit Radisson, probably the first white man to explore the shores of Lake Superior, was led by an Indian companion to a place near the banks of a small stream that flows into the lake east of the Pictured Rocks, where he saw "many pieces of copper uncovered," and was told that a mountain near by was "nothing else." As this spot is outside of the area of the copper-bearing rocks the copper was either "float" or had been hidden there by the Indians. Radisson was also told that an island at the end of Keweenaw Point (Manitou Island?) was "all of copper."

In the Jesuit ‘Relations’ of 1659–60 it is said that an Indian reported copper from Lake Superior in pieces as large as one's fist. In the ‘Relations’ of 1666–68 Father Allouez reported pieces of true red copper from an island in Lake Superior, which, according to his description, was probably Isle Royale.

In the ‘Relations’ of 1669–71 Father Dablon reports red copper from the Ontonagon River, concerning which he says opinions differed as to where it was actually found; and also from the end of Keweenaw Point — the latter place being an islet "which appears to be six feet square, and is said to be all copper." This sounds like the report made to Radisson, except that no size was given to Radisson's islands, whose distance from the mainland corresponds with that of Manitou Island. The Jesuit Fathers were also assured by the Indians that in the interior to the south of Lake Superior "mines" of copper were found in different places. This report might possibly have some significance in connection with the so-called prehistoric miners, if the term *mine* had been used by the Jesuit Fathers with the meaning usually attached to it to-day, as something *in esse* rather than *in posse* — a rock formation carrying a workable deposit of mineral, rather than an isolated mass, one that had been removed to a distance from the parent bed. We know that the term was used loosely by later writers, even in the first half of the 19th century. H. R. Schoolcraft in 1821, when referring to the celebrated copper mass on the Ontonagon River, speaks of it as a mine.

With the exception of the "islet" referred to by Dablon which was possibly a piece of mass copper projecting out of the water at a shallow spot near the shore, all of the copper found as late even as the latter half of the 18th century appears to have been "float," that is, masses of smaller or larger size that had been transported from their original beds, generally by glacial action. Indeed it was this fact that probably explains the statement of Capt. Jonathan Carver in 1778 that the copper itself costs nothing.

The area of «float» copper appears to have extended much beyond the territory immediately tributary to Lake Superior, for in 1700 Le Sueur found pieces of it near the mouth of the Chippewa River and another about four leagues above the mouth of the Saint Croix River, in Wisconsin. In later years similar finds have been reported as far south as Indiana and Illinois. But while Lake Superior was supposed to be the source of this copper we do not find any evidence that any white man — except always Father Hennepin — had even seen anything that could be called a copper mine (sic), as early as the time of Charlevoix. The latter in his history of New France, published in 1744, says «It is certain that there has been discovered in several places a considerable quantity of this metal, without even being obliged to dig much.» It is true that La Hontan early in the 18th century speaks of copper mines on Lake Superior, but he does not claim, like Hennepin, to have seen them. We also find many references to copper «mines» in the interior as reported by the Indians, who usually showed great reluctance to disclose their whereabouts to the white man.

Thus far the pieces of native copper found on Lake Superior were gathered on the edges of the islands and on the borders of the lake along the highways of navigation by canoe. It was not until 1765 that Alexander Henry, attracted by Indian reports of a large mass of copper, the one referred to by Dablon, visited the Ontonagon River and went up stream several miles above the junction of the east and west branches. He found, on a clay bank, at or near the edge of the stream, the copper mass, with some rock adhering to it through which ran small veins of copper. In 1771, revisiting the same place, he noticed also much copper bedded in stone, and left a party of miners there, «to make a trial on the hill, till we were better able to go to work on the solid rock.» They dug 40 feet into the clay bank and found frequent masses of copper. All went well during the winter, but when spring came, the clay thawed and caved in, and the party left. In recording the above facts, Henry added that «The copper ores of Lake Superior can never be profitably sought for but for local consumption. The country must be cultivated, and peopled, before they can deserve notice.» In a footnote to the above, having in mind the more roseate view then recently expressed by Alexander Mackenzie and earlier by Captain Carver, he adds, «The copper mines of Lake Superior have been more than once represented to the world in colors capable of deceiving fresh adventurers: and the statement in the text will not have been uselessly made, if it should at any time serve as a beacon to the unwary.» The fame of Henry's operations was probably spread abroad at the time, although his book was not published until 1809.

Henry's visit to the Ontonagon River marks the culmination of the efforts of two and a half centuries of search for the original source of the Lake Superior native copper — its location in the rocks of volcanic origin that almost surround that inland sea. It also marks the beginning of an industry that in spite of Henry's warning has grown to be one of the most important of the Northwest. Possibly the troubles that distracted the country during two wars, and the boundary disputes in the region of the Great Lakes, rather than the adverse sentiment caused by Alexander Henry's failure, kept back the development of the copper district of Michigan, but the spirit of expansion which during the administration of Jefferson found expression in the expeditions of Lewis and Clark and of Pike later found an echo in Gov. Lewis Cass, at whose initiative and under whose personal leadership an expedition to the Northwest was effected in 1820, one of the objects of which was to investigate the copper «mines» of Lake Superior. Henry R. Schoolcraft accompanied this expedition as mineralogist. They visited the Ontonagon copper mass, which Schoolcraft recognized as having been removed from its original bed of «serpentine» rock; from which circumstance he inferred that there must be extensive «mines» in the vicinity.

In 1832 Schoolcraft, this time with Dr. Douglas Houghton as geologist to the party, again visited the Ontonagon River and the famous copper mass. On the way thither Dr. Houghton found copper embedded in the trap rocks on the western side of Keweenaw Point, and expressed the opinion that the «trap rock formation was the original source of the masses of copper,» and that copper would probably not be found in that region in any other rock than trap, which Dr. Houghton at that time had seen only on Keweenaw Point.

During 1832 and 1833 Dr. Houghton visited the south shore of Lake Superior three times. Five years later he was appointed State geologist of Michigan and before his death, in 1845, had carefully examined the copper-bearing formations, had ascertained their altitude and extent, had located a number of copper veins and had given to the world enough information to attract at once a large body of prospectors. The interest thus stimulated in the Michigan copper district soon led to the opening of some of its most famous mines. The success of this new industry, as predicted by Captain Carver, was soon assured by the building of the canal at Sault Sainte Marie, which afforded the products of upper Michigan cheap transportation from the wilderness to market.

Geology.— The «trap» rocks that constitute the greater part of the Lake Superior copper-bearing formations are a series of old lava flows. All around the western end of the lake through Michigan, Wisconsin and Minnesota, the trap beds extend for several miles in width, striking nearly parallel with the general trend of the shore line, and dipping always toward the lake, the dip being usually flatter near the shore than it is further back. Associated with these trap beds occur beds of reddish conglomerate or sandstone at different intervals, composed of the débris of the traps and associated more acid rocks.

On the extrusion and flow of lava which has been under pressure, the pent-up gases in it expand near the surface of the flow like the bubbles in a glass of champagne, and as the surface of the flow rapidly congeals, each gas bubble forms a cavity or amygdule. In the scoriaceous or amygdaloidal portions of the lava beds, which are thus characteristic of the upper surface of the bed, though sometimes found at the bottom — also in cavities caused by chemical changes or by fractures, and occasionally in the conglomerates — are frequently found the deposits of native copper that characterize these formations. At different angles to the strike of these beds fissure veins of later age are found, several of which, notably the Cliff, Phœnix and Central, proved also to be rich in copper, which in the Cliff mine carried with it a large amount of silver. The copper occurs either in minute flakes, or in more compact bodies from the size of a pin head or less to masses of 500 tons or more in weight, of shapes rounded like a boulder or branching irregularly through the parent rock-mass. Large masses seldom occur in the conglomerates, but in these beds individual boulders are often found entirely replaced by copper. In the early days of mining here it was the fissure veins that were sought and worked almost exclusively. They produced a large amount of mass in a small area of ground, and this could be made marketable without the expense of treatment in a stamp mill. By the time the fissure veins were beginning to show signs of exhaustion the amygdaloid deposits came more into notice and soon proved that while they were less rich than the veins, volume for volume, they were much more extensive, and, with the progress in mining methods, would probably prove profitable if worked on a large scale. The substitution of air drills for hand drills and of high explosives for black powder helped to confirm this promise. Meanwhile the discovery of the Calumet conglomerate with its wealth of mineral had been made. As work on the fissure veins was gradually being abandoned, the mines were in popular parlance grouped into two classes — amygdaloids and conglomerates. To-day, however, it is apparent that all so-called amygdaloid copper deposits are not properly so named and a further division is possible. Throughout the formations, especially along the upper surfaces of conglomerate beds, planes of weakness have existed along which there has been more or less movement of the overlying formations. These planes of weakness not infrequently coincide with the amygdaloidal upper portions of the trap beds, both in strike and dip, and shearing movements along them have fractured the rock to so great an extent as to form a veritable breccia, in which copper was later deposited in workable quantities. Indeed the copper often occupies the interstices in these breccia beds, while the amygdules of the rock composing the breccia are entirely filled with minerals other than copper. In a case of this kind the term «amygdaloid» deposit, if not confusing, is at least inexact.

Exploration.— The greater part of the area underlain by the copper-bearing formations of Lake Superior rise to an elevation of from 400 to 700 feet above the lake. Several ridges stand out above this general plateau whose summits show naked rock, and even in the lower ground there are some exposures of rock in place, but over a large area there is a heavy covering of «drift» — sand, gravel and boulders — which completely conceals the rock surface and renders difficult a successful search for mineral. When mining operations began on Keweenaw Point the attention of the early prospectors was attracted by grooved stone hammers, some of which weighed as much as 30 pounds, generally found on the ridges, in or by the side of shallow excavations that showed copper embedded in the rock. These traces of crude mining by a former generation evidently served as a guide to the early white miners in locating the most prominent deposits. The ridges naturally consist of the hardest rock — the massive trap beds that have resisted erosion better than the softer amygdaloids. By following these ridges the early prospectors located the fissure veins, and with them some quasi fissure veins that ran parallel with the formation and contained large masses of copper, rough prongs of which projected above the rock surface. A «conformable vein» or an amygdaloid deposit thus located would be followed for miles, until perhaps it disappeared beneath a covering of drift. Sometimes a large block of cupriferous rock would be found, whose angularity indicated its probable nearness to the parent bed. Surmising the direction of the glacial movement the prospector would dig a series of trenches or *costeans* at right angles to the strike of the formation, on the side whence the glacial movement was supposed to have come. But here again in early days the fact was not recognized that Keweenaw Point had been the scene of glacial movements from at least two directions, and thus in one well-known instance explorations were vainly made in the wrong direction from the blocks of rich float-rock.

With the progress of geological investigation it was realized that the conglomerates interbedded with the traps and representing old sea beaches were more or less continuous around the ancient basin. Their character, it is true, does not remain constant from point to point, for this depends in a great measure upon the rocks that lay behind them during the process of their formation. They furnished reliable aid to correlation, however, and could be followed and recognized for long distances even across drift-covered areas. The lava beds, on the other hand, from their broad general similarity, usually were not safe guides. In some cases, however, even these could be identified over long distances by some marked peculiarity. If a workable copper deposit was known to exist near one of these conglomerates or near a recognizable trap bed, the latter was traced out and a pit or trench was then dug at a known distance from it equivalent to the distance of that bed from the copper-bearing bed at the place where the latter was last seen, allowance being made for ascertainable changes in the dip of the formation between the two places. In this way the Baltic lode of the Champion Mine was located about three miles from the Baltic Mine, although in the intervening distance the strike of the formation had changed 34 degrees. By taking the great Greenstone ridge in Keweenaw County as a guide the position of the northward extension of the Kearsarge amygdaloid bed was in a similar manner approximately ascertained about six miles from the nearest point at which it had been previously opened. While trenching was in progress to uncover this bed, the recognition of an isolated outcrop of its footwall — a very characteristic rock — pointed more exactly to the location of the amygdaloid. Exact calculations are not always possible, for the dip of the beds from younger to older may change — commonly does change — and can seldom be determined for any one place, in advance of mining. The diamond drill is often an important aid in cases like the above, where the thickness of the drift-covering makes trenching impossible or too expensive.

Development.— A mere deposit of mineral or an isolated mass is not necessarily synonymous with a «mine,» as previously remarked. As now frequently understood, a «mine» is a deposit sufficiently exploited to afford reasonable hopes that it can be worked at a profit. To ascertain whether a native deposit of copper in Michigan will pay requires a good deal of time and the expenditure of a large amount of money. Shafts must be sunk, generally, in the lode to test the latter continually in depth, and drifts must be driven from the surface, to show the lateral extent of the deposit, its uniformity and richness. If the rock mined carries from 1 to 2 per cent of fine copper, or from 20 to 40 pounds per ton, and the lode is 10 feet or more wide, the management knows that by mining on a large scale the costs can be brought down to a paying basis with copper at about 12 cents a pound. Some mines with wide deposits can make a handsome profit at the last named price. In the exploratory stages of a mine these factors must be ascertained before a permanent and economical plant can safely be installed. By neglecting this precaution several notable failures have been made and expensive plants erected only to be sold out later at a loss. In Michigan the copper deposits usually extend to great depths, some of the older mines being a mile deep vertically. Powerful hoisting engines and other machinery in proportion are ultimately necessary for this work. The permanent shaft can be sunk in the footwall so as to enable the removal of the maximum of copper-rock without endangering the shaft. The percentage of copper-rock that can be safely and cheaply mined often has an important bearing on the method of mining that is to be adopted. The shafts where possible follow the dip of the lode, thus avoiding the unnecessary mining of barren ground to reach the lode from the shaft, as would be the case if the latter were vertical. Shafts are now placed a thousand feet or more apart. The drifts from the shafts are driven along the lode from 85 to 150 feet apart, measured on the dip of the lode. From these shafts as starting points all of the lode matter possible is broken down from above by «stoping,» as far as the next higher level, by various methods; sorted where possible, and the barren portions left in the mine or returned to it from the surface, as «filling» to support the hanging wall. The amount thus discarded will vary according to the nature of the deposit, up to 40 per cent of the total rock mined. In some cases the copper is so evenly disseminated through the rock that sorting is impracticable and all of the rock goes to the mill. The copper rock from the stopes is trammed by hand, or where the shafts are far enough apart, by mechanical power, to the nearest shaft, hoisted in the cars in a cage, or in skips of a capacity of two to eight tons, dumped on the surface in the upper part of the rock-house and here sometimes sorted again, or all of it delivered to breakers, by which it is crushed to small sizes; it is then transported to the stamp mill. The larger masses of copper mixed with rock are placed under a heavy hammer by which the rock is beaten off; the masses are then sent directly to the smelter. After going through the breakers the fine rock falls into large bins and is drawn off into railroad cars for transportation. To save expenses as many operations as possible are performed by gravity. A constant effort also is made to introduce labor saving mechanical devices both underground and on the surface.

Stamping.— The crushed copper-rock from the mine in centre-dump railroad cars is taken to the stamp mill, which sooner or later forms part of the equipment of every permanent mining company. Nature seldom furnishes a place that combines all the essentials of a good stamp mill site. The principal of these are an abundant water supply, dumping-room for the waste products, sufficient elevation for handling the material by gravity through the different stages of the stamping process, accessibility by railroad and storage room for fuel. The absence of any one of these essentials adds materially to the cost of construction or to that of subsequent operation. Where possible, the side of a hill is selected near a body of water. A stream that will supply three and a half million gallons a day throughout the year is large enough for a one-head mill with a capacity to stamp from 500 to 700 tons of melaphyre or 300 tons of conglomerate in 24 hours. If the stream can be dammed at an elevation sufficient to deliver its water by gravity at the mill about 40 feet above the point where the waste launders leave the latter, its water is utilized in that way. A dam built on a stream near the shore of Lake Superior, to serve two mills that have a daily stamping capacity of about 4,000 tons, cost about $250,000. To pump water from Lake Superior for a mill of nearly the same capacity costs between one and one and a half cents per ton of rock stamped, to which must be added interest and maintenance charges on a pumping plant that would cost nearly $100,000. To obtain water from Lake Superior requires a tunnel under the lake or a large pipe leading from the shore to a crib far enough out in the lake to avoid being choked by stamp-sand and other obstructions. This distance is usually about 1,000 feet.

Where the stamp mill cannot be built low enough to enable the rock cars to run from grade into the space above the rock bins, the cars must be hauled up, one by one, by special haulage mechanism. Where the mill is built with the main lower floor but slightly elevated above the level of the dumping ground, the stamp-sand may eventually have to be carried long distances in launders and sometimes must also be lifted to the necessary height by immense sand wheels. Where mills have been built on the exposed shores of Lake Superior the waste sands are removed from time to time by storms, but if built on bays or sheltered places, the heaping up of the sand is likely to give trouble unless the waste launders from the mill are sufficiently elevated above lake level.

The function of the stamp mill is to crush the rock fine enough to be able to separate it from the copper and to recover a maximum amount of the latter. The copper rock from the mine is dumped from the cars into the storage bin at the back of the mill, which is of sufficient capacity to provide against slight delays incident to transportation. From the bottom of the bin the rock runs over a feed pan into the mortar of the steam stamp, into which also a stream of water is constantly flowing. Here the rock is crushed to a size small enough to be splashed by the downward action of the stamp-shoe through screens around the mortar. The larger lumps of copper are withdrawn from the bottom of the mortar through a tube against the force of a small stream of water which prevents the lighter material from discharging with them. The principle of the so-called hydraulic discharge is utilized in some form at several stages of the stamp mill process. The particles of rock and copper that pass through the screen around the mortar then go through a cylindrical revolving screen or «trommel,» the oversize from which under a practice that is now going out of use is carried back to the stamp, or, under better practice, passes directly to a set of rolls that crushes it to a smaller size, thus liberating the included copper and increasing by so much the capacity of the stamp. The entire product from the screens and from the rolls then passes through launders to the classifiers and from these the coarser part of it goes to the jigs. In some cases there is placed under the launders near the stamp-head a box into which by applying the principle of hydraulic discharge, the larger particles of copper fall, the smaller particles of copper and nearly all of the rock passing on to the classifiers. A classifier is a part of the launder system, or a long box through which flows the stream of water from the heads, mixed with finely crushed rock and copper particles; in the bottom of the classifier at stated intervals are openings through which particles of copper and rock drop against a head of water at each opening that can be regulated so as to permit particles of different weight to fall out at the different openings, the heaviest through the first opening, the lightest through the last. On the jigs successively smaller particles of copper are caught on screens of from 10 to 16 mesh, through which gradually sift the very fine copper particles; above the copper caught on the screens accumulate particles of rock which include copper called «middlings.» The larger particles of waste rock are carried off gradually at the surface by the jigging motion and by the flow of the water, to the waste launder. The middlings are taken off automatically through an air discharge in front of the jigs and are ground in a Chilian mill, whence they pass to the slime tanks. The fine material passing through the jig sieves goes directly to concentrating tables. The finest particles of rock and of copper that flow through the classifiers from the heads go from these to the settling tanks, where the fine particles of copper with a certain amount of rock material settle gradually to the bottom, and the overflow from the top of the tanks goes to the waste launders. The settlings are then treated on tables provided with elevated strips or «riffles» and by a quick repeated jerky motion in the direction of their length the heavier particles of the pulp, namely, the copper, are gradually separated from the rock matter and collected at the end of the table in tanks or barrels. Middlings or material containing a good deal of rock and some copper from along the irregular line of demarcation between copper and rock are collected and retreated in the same way.

Smelting.— The product of the mine that goes directly to the smelter is in the form of masses, often several tons in weight. This «mass» copper with the product of the stamp mill constitutes what is called «mineral.» Large pieces of rock crushed in the breakers at the mine frequently contain small masses which are collected from the rock as the latter goes into the stamp-heads and shipped to the smelter in barrels. This product is called «barrel work.» Some pieces of copper as large as one's fist unavoidably get into the stamp-heads and these are taken out through the hydraulic discharges as described above and are shipped as «headings.» The finer copper mixed with more or less rock is collected in different grades, the number of these being sometimes as many as six, but in modern practice being reduced to as few as two. The smallest of these grades are called «fines» and «slimes,» of which many particles are often minute and light enough to float on a moderate current of water, and hence are difficult to save.

The impurities found with the product of the stamp mill are principally the «vein» rock, from which, owing to the intimate mixture of the copper and rock, the separation of the former has been incomplete, and incidental impurities, such as iron, sulphur, arsenic, with traces of nickel and of some of the rarer elements. The function of the smelter is to remove the impurities and to leave the copper in a condition best fitted for the different uses to which it is to be put. These are principally: (1) For electrical purposes, as wire, where great conductivity is required; (2) for rolling into plates, where great tensile strength may be desired; and (3) for mixing with other metals to form alloys. The forms in which it leaves the smelter are indicative of these uses. They are respectively bars, cakes and ingots. When it is known that .07 of 1 per cent of arsenic in copper will reduce the conductivity of the latter to 75, and that arsenic is almost always present in copper ores, and to some extent also in native copper, the necessity of careful refining will be realized. Copper derived from copper ores generally contains enough impurities to render it unfit for electrical purposes unless it is refined electrolytically. For this purpose it is cast into plates called anodes. In the Lake Superior region the copper derived from the higher or younger formations of the copper-bearing series has generally been found to be pure enough on leaving the smelter to be used for wire (99.9 per cent fine and upwards), but the copper from the lower or older beds usually carries enough arsenic to render such a use impossible without further refinement. This copper, on the other hand, with the proper percentage of arsenic, is tougher and more desirable for some uses than the purer grade.

The mineral is treated first in a melting or reverberatory furnace, the flame passing from the fire-box over the copper under a low arched roof with a stream of air brought in from below. This is an oxidizing process and the slag that separates from the copper and is drawn off from the surface of the latter contains from 8 to 14 per cent of the metal, largely in the form of oxides, mixed with a large amount of the impurities. After the removal of the slag, charcoal is thrown on top of the melted copper and the liquid mass of the latter is agitated by the insertion of green poles of hardwood ("poling"), the ignition of which and of the charcoal produces the carbon that takes up the oxygen in the copper, thus changing the action of the furnace from an oxidizing to a reducing process. This is often preceded by blowing a charge of air through the molten copper. By dipping small buttons of the metal in a trial ladle from time to time, if the copper sets with a level surface the process of "poling" is complete. If the reduction is overdone, the charge must be reoxidized and again reduced. Thereupon the copper is ladled or run out into moulds. The tendency of modern practice has been to increase the size of the melting furnace contingent upon the ability to keep the heat throughout of an even temperature. Some modern furnaces can take a charge of 100 tons at a heat. It has also been found advantageous instead of doing the refining in these large melting furnaces to run the copper from them into special refining furnaces. The fuel used in the melting furnace is soft coal.

The slag derived from the reverberatory furnace is broken up and eventually taken to a blast furnace, otherwise called a cupola, where the action is reducing, and here the slag is remelted. This process is substantially the same as the process in the reverberatory furnace except that the copper being mixed with a large amount of slag, other substances such as limestone, iron or silica are added to form a proper mixture for fusing and for the proper separation of the copper. The relative amounts of the several materials are ascertained in advance by analysis. All of the ingredients are mixed with anthracite coal, with or without coke, and to stimulate ignition a cold blast of air under compression is driven upwards through the mass. The copper falls out and is drawn off at the bottom of the furnace, containing even then a larger amount of impurities than the product of the first process; this copper should be refined separately. In practice the slag-copper is poured into ingots or ingot-bars, but never into wire bars. It is sometimes specially branded.

The slag that is finally rejected contains about .7 of 1 per cent of copper and is usually discharged into a stream of water which granulates it and carries it away in launders.

LUCIUS L. HUBBARD,
General Manager of Champion Copper Company, Painesdale, Mich.

COPPER, Refining of. See ELECTRO-CHEMICAL INDUSTRIES.

COPPER AND BRASS INDUSTRY. The Naugatuck River has its sources in the hills of northwestern Connecticut and flows southward about 40 miles to its junction with the Housatonic River at Derby, taking its course through a narrow, winding valley. From Torrington, at the head of the valley, to Derby there is a fall of about 600 feet, and wherever the valley broadens to give room for a village or a city there are water privileges, and the power is utilized for manufacturing purposes.

In this narrow valley, which contains a large population, evidence of thrift and prosperity is everywhere seen in the neat, comfortable homes of the workingmen and the fine houses of their employers. This is the seat of the brass-rolling industry of America. Many large corporations are here directly engaged in this business, producing about three-fourths of the total quantity of rolled brass manufactured in the United States, giving direct employment to 25,000 persons and indirectly to many thousands more. About one-half the total quantity of copper consumed in the rolling and wire mills of the United States is conveyed annually to the Naugatuck Valley for use in these manufacturing establishments.

Here were found the men of foresight, energy and activity who could originate great enterprises and carry them to completion. They began the brass-rolling industry 70 years ago. Its development and progress with the growth of the country are due to the energy and ability of those who have conducted the business and furnished the necessary capital for its enlargement. The causes that have led to the concentration of this industry in the Naugatuck Valley are more complex. The cheap power afforded by the water privileges in the valley undoubtedly led to the establishment there of the first rolling-mills, which, as they increased in size and capacity, finally outgrew the water-power and are at the present day operated by steam or by steam and water-power together.

The mills originally established in the valley have enlarged and extended from time to time to keep pace with the growing demand for brass. According to the general law governing the concentration of kindred industries and trades in particular localities, new mills were started there, even after the water power had ceased to be a determining factor in the problem of location. Other advantages, such as the cheapness and accessibility of wood of the variety best suited for annealing purposes, were among the causes that held the trade in the valley. Then, too, there arose a race of workmen skilled from generation to generation in the mixing, rolling and manipulation of brass; and as time went on and competition increased, the production of rolled metal becoming less profitable, many of the rolling-mills began remanufacturing their own metal. Other corporations were formed, some being direct offshoots from the brass mills, until the location became what it is to-day; a great centre for the reworking and consumption of metal. There are many reasons why it is desirable that a brass-mill should not be too far from the place where its product is chiefly consumed, and thus it happens that, while a few brass manufactories are operated in other parts of the country, the Naugatuck Valley still is and probably will remain the seat of the brass-rolling industry in America. Other enterprises, such as the rolling of iron and steel, thrive best where their raw material, their fuel and labor are cheapest and most accessible, transportation, labor and fuel being great factors in the cost of the product; but the brass manufacturer, working a high-priced raw material, and bringing his finished product to the point of nicety in gauge and quality, finds the cost of labor, fuel and transportation factors of less importance relatively, and he is governed largely by other considerations in his choice of locality. Therefore, while the shifting centres of the manufacture of iron and steel are marked throughout the country by abandoned furnaces, the seat of the brass-rolling industry remains to-day where it was established nearly a century ago, it being a noteworthy fact that nearly all of the brass-mills outside of the State of Connecticut were constructed or are operated by Connecticut men.

Israel Coe, a farmer of Connecticut, John Hungerford, of Connecticut, and Anson G. Phelps, a capitalist of New York, and founder of the house of Phelps, Dodge & Company, were pioneers in brass manufacturing in this country, and in 1834 they built a brass-mill at Wolcottville, now Torrington, Conn. Previous to 1830 brass was imported, or manufactured here in a very primitive way. As early as 1811 James G. Moffett of New York rolled brass in small quantities, using for power a sweep actuated by oxen. In 1802 the manufacture of gilt buttons was begun in Connecticut by Abel Porter & Company. At that time these buttons were articles of fashionable use. To obtain brass for this purpose the mixture was cast in ingots at Waterbury and taken to Bradleyville, near Litchfield, Conn., where there was an iron-mill driven by water power; here it was broken down and rolled into strips, and returned in a rough state to the button factory in Waterbury, where it was rolled thinner by being passed between two rolls two inches in diameter, driven by horse power. The copper for brass-making was obtained from old boilers which had been used in distilleries and in sugar-making. This copper was cast into ingots and mixed with spelter, which was obtained from abroad. In 1808 Abel Porter & Company purchased the water power now owned by the Scovill Manufacturing Company at Waterbury, and soon afterward put in rolls suitable for breaking down and finishing brass. For a period of about 20 years they rolled brass, but it does not appear that their production was any more than enough to supply their own requirements. In 1830 the firm of Holmes, Hotchkiss, Brown & Elton established a mill and engaged in the manufacture of sheet brass at Waterbury. This was substantially the beginning of the sheet-brass business in America, although the metal, in small quantities, may have been occasionally supplied to consumers before that time by the firm of J. M. L. & W. H. Scovill and by Benedict & Coe, of Waterbury.

There was at that time also a demand for brass kettles, which were manufactured in England by a process known as the "battery" process: that is, they were hammered into shape from metal blanks. The establishment of the mill at Torrington, at the head of the Naugatuck Valley, in 1834, was for the purpose of rolling brass for use in manufacturing these kettles and to supply the growing demand of the button factories. A small rolling-mill was built, with machinery imported from England, and Israel Holmes of Waterbury was engaged as manager of the mill. There was great difficulty in securing workmen competent to carry on the business. Mr. Holmes was sent to England and succeeded in procuring a few experienced men. He afterward made another trip abroad for the same purpose, but the English manufacturers, fearful of losing their American trade, endeavored to prevent him from hiring their men, and it was with great difficulty and some danger to himself that he succeeded in embarking a colony of workmen and their families, about 30 persons in all. These were landed at Philadelphia, taken in a schooner from there to Hartford, Conn., from which place they proceeded on foot through the woods, a distance of 25 miles, to Torrington.

From this small beginning, and with no end of difficulty and discouragement, the enterprise continued to grow. Local competition arose, and in 1840 Edwin Hodges of West Torrington started a mill for the purpose of making brass kettles and also for drawing brass wire. This seems to have been the first brass wire-drawing establishment in this country. It was located in Cotton Hollow, in the town of Torrington. The enterprise was unsuccessful and the mill was soon closed, with the loss of all the capital invested. In 1841 the original enterprise at Torrington was made into a stock company, with a capital of $56,000. It was named The Wolcottville Brass Company, and the incorporators were John Hungerford, Anson G. Phelps and Israel Coe. The records of this company for the first few years of its existence contain some interesting details. The copper used was imported from Chile, or was obtained in the form of old copper, which was collected from different places throughout the country. The price of copper was then 18¼ cents per pound. Spelter, which was imported, cost 8⅛ cents per pound. The fuel used was mainly wood, but some Lehigh coal was procured, which cost, at Hartford, $8.43 per ton, to which was to be added the cost of transportation by teams from Hartford to Wolcottville. Fire-brick for the furnaces cost $60 per 1,000. The manufactured product, in the form of rolled and sheet brass, was valued at 26 to 30 cents per pound. It was taken by teams either to Waterbury or 25 miles across a hilly country to Hartford, and from there shipped on sloops to New York. Upon the site of the works occupied by the Wolcottville Brass Company are to-day the factories of the Coe branch of The American Brass Company. The name of Anson G. Phelps is perpetuated by the city of Ansonia, the Ansonia branch of The American Brass Company and the Ansonia Clock Company, as well as by the firm of Phelps, Dodge & Company, Inc., which he founded; and the name of Israel Holmes appeared in the title of the corporation of Holmes, Booth & Haydens, of Waterbury.

The decade from 1840 to 1850 saw the birth of many of the prominent brass manufacturing corporations of the present day. In 1843 a joint-stock company at Waterbury was organized under the title of the Benedict & Burnham Manufacturing Company, with a paid-up capital of $100,000. Aaron Benedict was president and treasurer and John S. Mitchell secretary. Mr. Aaron Benedict continued at the head of the company until his death in 1873.

The Waterbury Brass Company began business in 1845 with a capital of $40,000. Among the incorporators were John P. Elton, Lyman W. Coe, Israel Holmes and Hobart V. Welton.

In 1849 the Naugatuck Railroad was completed and the product of the valley mills was thereafter shipped by rail to tidewater at Bridgeport.

In 1848 Thomas Wallace and his sons, John, William and Thomas, began the business of wire drawing at Birmingham, Conn. Their cash capital was $500. Their knowledge of their trade enabled them to increase their business and in a few years they built a factory at Ansonia, which has been greatly enlarged and is now owned and operated by the Coe branch of The American Brass Company.

The Scovill Manufacturing Company of Waterbury succeeded the firm of J. M. L. & W. H. Scovill and was incorporated in 1850 with a capital of $200,000, which has since been increased to $5,000,000. They now manufacture brass, German silver, etc., and are extensive remanufacturers of metal.

The Coe Brass Manufacturing Company of Torrington, Conn., was founded by Lyman W. Coe in 1863, and succeeded the Wolcottville Brass Company. Lyman W. Coe, the son of Israel Coe, was the president of the corporation, which began business with a capital of $100,000. Their capital has been increased from time to time and they are now merged in The American Brass Company.

In 1844 Anson G. Phelps purchased extensive lands in the vicinity of what is now the city of Ansonia, which was founded by him and named in his honor. He constructed a dam across the Naugatuck River, a canal, large reservoirs for water power and built a mill for rolling copper. The firm of Phelps, Dodge & Company had for some years prior to 1844 operated a copper rolling-mill at Birmingham, Conn. The water privilege at Ansonia is now owned and operated by the Ansonia Land and Water-Power Company and is the source of water power for the city of Ansonia. Mr. Phelps brought from the Wolcottville works J. H. Bartholomew and George P. Cowles, who managed the business at Ansonia under the name of the Ansonia Brass and Battery Company, the term «battery» being indicative of the process by which brass kettles were hammered from metal blanks. This method of making kettles was in use until 1851, when it gave place to a patented process for spinning kettles from circular blanks of metal. The business of the Ansonia Brass and Battery Company was conducted by the firm of Phelps, Dodge & Company of New York. A brass-mill was built, and later a wire-mill. The company afterward engaged in the manufacture of clocks. In 1869 this manufacturing enterprise was incorporated under the name of the Ansonia Brass and Copper Company. In 1877 the manufacture and sale of clocks had increased to such an extent that it was decided to form a new joint-stock corporation under the name of The Ansonia Clock Company, which began business on 1 Jan. 1878. The location of this company's business was transferred to Brooklyn, N. Y., where large factories were erected and are now in operation, producing clocks and watches which are marketed in every part of the world.

The American Brass Company, incorporated under a special charter from the State of Connecticut, with a capital at present of $15,000,000, — which may, under their charter, be increased to $20,000,000,— began business in January 1900. It is a merger of the Coe Brass Manufacturing Company, The Ansonia Brass & Copper Company, The Benedict & Burnham Manufacturing Company, The Waterbury Brass Company, The Holmes, Booth & Haydens Company, The Chicago Brass Company.

Taking into account the capital employed and the magnitude of its operations in brass and copper this company is the most important brass manufacturing enterprise in the world and the largest single consumer of copper, giving employment to about 15,000 persons.

During many years brass manufacturing was conducted on what would now be regarded as a very small scale, and, although the methods pursued at the present day are substantially the same as at the beginning, great progress has been made in cheapening these methods and improving the quality of the articles manufactured. It is stated that in the early forties it was customary for the manufacturers at Waterbury annually to appoint a committee to make the long journey to Baltimore for the purpose of purchasing copper for the season's supply. At that time the purchase of 500,000 pounds of copper was sufficient for a year's supply for these manufacturers. At present that quantity would not supply the demand of the Naugatuck Valley for one day.

Copper and spelter being the metals from which brass is made, a brief account of the sources of supply from which these materials are obtained will throw some light upon the development of the business of brass and copper rolling. The first copper mine worked in the United States was the Simsbury mine at Granby, in Connecticut. The record of this mine extends back to the year 1705. It was worked until 1770, but was not profitable, and only a small quantity of ore was taken out. During the War of the Revolution it was used as a prison. About the year 1719, the Schuyler mine, near Belleville, N. J., was opened and became one of a number of small mines which were worked in that section of the country for a series of years following. The Gap mine, in Lancaster, Pa., was started in 1732. The production of copper from all these openings, however, was of very little commercial importance, and until the Lake Superior region became a source of supply, the consumers of copper in the United States had to procure their raw material in Chile. It was brought to this country in the form of pigs, and refined near Boston, at Baltimore and at other points along the coast. In 1844 the Cliff mine, near Eagle River, Lake Superior, was opened, and in 1845 regular records of production were begun. The great development of the copper-mining industry at Lake Superior soon placed the United States in the front ranks of the copper-producing countries of the world, and the product of these mines, being of a quality much finer than the copper produced abroad, naturally took the place of the foreign product for home consumption. Copper production in the United States from 1845 to 1880 kept pace with home consumption, a comparatively small quantity being exported up to the last-named period, so that the record of the copper produced in the United States between the periods named will indicate the progress made in manufactures of brass and copper. Beginning in 1845 with a product of 100 tons (which was much less than the quantity required for home consumption), the record for periods of 10 years is as follows: 1850, 650 tons; 1860, 7,200 tons; 1870, 12,600 tons; 1880, 27,000 tons; 1890, 130,000 tons; 1900, 303,000 tons. In 1917 production reached 970,000 tons, valued at $540,000,000.

Comparatively little fine copper was imported to the United States after 1860. In 1879 the

Lake Superior region furnished about 83 per cent of the total quantity of copper produced here, but after 1880 the opening of the copper-mining regions of Arizona and Montana increased the output largely beyond the quantity required for domestic use. A heavy exportation at once followed, and this country became one of the world's great sources of supply.

The Lake Superior district includes the first notable deposits of copper discovered on the American continent. This district was the greatest producer for half a century; the product is still very large, the Michigan output in 1915 being 158,000,000 pounds. The copper found there is remarkably pure, and is called Lake copper, being marketed without electrolytic refining, as is necessary with most other coppers. The Rocky Mountain copper deposits became of commercial importance about 1868, when the Butte development got under way. Three great fields have opened up in the Rockies, outdistancing the great Lake deposits. In 1913 the Arizona production was 404,000,000 pounds, or the equivalent of the entire world's production in 1890. The same year Montana produced 286,000,000, or more than the United States total of 1890. The other large producing States in 1913 were Michigan, 158,000,000; Utah, 132,000,000; Nevada, 85,000,000; New Mexico, 50,000,000; California, 32,000,000; the year's total for the United States being 1,224,484,098 pounds. In 1917 Arizona produced about 710,000,000 pounds; Montana, 370,000,000 pounds; Michigan, 272,000,000 pounds; Utah, 240,000,000; Alaska, 145,000,000; Nevada, 103,000,000; New Mexico, 100,000,000; Caliornia, 65,000,000; Tennessee, 21,000,000.

As measured by districts, the Butte smelters, which began in 1868, have been the world's largest producers of copper, the entire product to 1915 being 6,177,800,000 pounds; the Lake Superior district, which has produced since 1845, yielded a total to 1915 of 5,360,995,000; next comes the Bisbee, Ariz., district, opened in 1880, with 1,710,300,000; and the Morenci-Metcalf district, also of Arizona, with 1,104,200,000. These are the four greatest copper districts of the world.

The quantity of copper produced in the United States is reported by the United States Geological Survey to be as follows:

	Pounds.
Refined copper produced by the regular refining companies from the smelters of the United States	1,387,705,532
Of foreign origin	246,498,925
	1,634,204,488
Compared with 1914	1,533,781,394

The consumption of new copper in the United States in 1915 is estimated to have been 1,043,461,982 pounds, to which may be added old copper from sundry sources such as old copper and brass, scrap, etc., estimated to be 392,274,000 pounds, making about 1,435,000,000 pounds of new and old copper available for use during the year. This estimate includes at least 150,000,000 pounds of copper produced by remelting clean scrap accumulated in the process of manufacturing copper and brass articles. The apparent domestic consumption of new copper in 1914 was 640,445,000 pounds.

A fair estimate of the average price of copper in the United States from 1845 to 1859 is 20 cents per pound. From 1859 to 1876 the yearly average price of copper varied from 20½ cents to 32 cents per pound, with the exception that in the years 1864 and 1865 the price was advanced, so that in 1864 the average price of Lake Superior copper was 46¼ cents per pound and in 1865 36¼ cents. After 1876 there was a gradual decline in the yearly average price, which was 18⅝ cents in 1877 and 11¼ cents in 1887. In 1894 the price touched 9 cents per pound, which is the lowest point recorded.

In 1899 the increased demand for copper in the United States and abroad was the cause of a rapid advance in the price of the metal, which sold as high as 18 cents per pound. The large exports (159,000 tons in the year 1900), and the steady increase in the demand for home consumption, kept the price between 16 and 17 cents until December 1901.

In the fall of 1901 it became known that a considerable stock of unsold copper had accumulated in the hands of one of the largest of the producing mining companies. Meanwhile, owing to decreased consumption abroad, the exports of copper had fallen off at the rate of about 65,000 tons per annum (the total quantity exported in 1901 being about 95,366 tons). Toward the end of the year there was a sharp decline in the London market, followed by a series of reductions in the price of copper in New York, which, emanating from one source, brought the price, within a period of 30 days, from 16¾ cents down to 11 cents per pound. The first effect of this action was to check consumption, but when it was known that copper could be bought for forward delivery at 11 cents per pound, the demand for manufactured copper increased to such an extent that large buying of the raw material followed and the price of copper quickly advanced to 12½ cents. The average price of Lake copper during 1902 was 11⅞ cents, and in 1903 about 13½. The average price obtained by the Lake Superior mines for copper during 30 years previous to 1903 was about 12¼ cents. From 1903 to 1913 the average price of electrolytic copper was about 15 cents per pound. In 1916 and 1917 it was slightly above 27 cents per pound.

Since we became great exporters of copper, the price of this metal in the United States has been nearly at a parity with the price in Europe. With increased production the cost of mining has been greatly reduced, while improvements in metallurgy and methods of electrolytic extraction have brought into the market great quantities of copper suitable for the finest work from sources which formerly furnished only coarse and ordinary grades of material. In former years the tariff upon copper affected the price of the raw material in this country, often enabling the mining companies to obtain from the consumer at home a higher rate than that which ruled abroad. The price of copper in this country was sometimes sustained by arrangement between the mining companies, who would market the copper here at a fixed price and ship their surplus product abroad at a considerably lower rate. The American brass manufacturer was, therefore, usually confined to a home market for his product, and the statement that, in certain cases, he succeeded in taking large foreign contracts for brass, with the disadvantage of having to pay a higher price than his competitor abroad, not only for his raw material but for his labor and supplies, is the best possible tribute to the excellent quality of his work. Ingot copper was admitted to this country, duty free, until the act of 30 July 1846, when a duty of 5 per cent was imposed. The act of 3 March 1857 restored copper to the free list. Subsequently duties were imposed upon copper: in 1861 of two cents per pound, and after that of from two and a half to five cents per pound. The McKinley Bill made the duty one and a quarter cents per pound, and at present ingot copper is on the free list.

The first refined spelter produced in this country was made in the year 1856, at Bethlehem, Pa., from ores mined there, and it was sent to the government arsenal at Washington. Up to 1865 or 1866 the spelter used by brass manufacturers was imported from Germany and Belgium. In 1867 the Missouri Zinc Company, at Carondelet, Mo., began to make spelter from Wisconsin ores. The first year they made about 1,800 tons; the next year about 2,500 tons. This was used in the United States. In 1869 the first zinc ores were discovered in southwestern Missouri, and since then the development of the zinc industry has been constantly increasing. The output of the year 1903 was 157,900 short tons of metallic zinc or spelter. The production and consumption of spelter in the United States in 1914 and 1915 is estimated by the United States Geological Survey to be as follows:

	Short Tons	Value
1914	353,449	$36,414,000
1915	489,519	121,401,000

The apparent consumption of spelter was 299,125 short tons in 1914 and 354,382 short tons in 1915. The abnormal demand for high grade spelter in 1915, for use in the manufacture of brass for ammunition exported to Europe, caused an unprecedented advance in the price of the metal which ranged from 6 to 25 cents per pound. The average selling price for prime western spelter was about 12.4 cents per pound but sales of some of the higher grades were made at more than double that price. The number of retorts at zinc smelters increased from 115,114 at the close of 1914 to 156,658 at the close of 1915. And it is estimated that at the end of 1916 the spelter producing capacity of the country was about 900,000 tons. American brass manufacturers have used domestic spelter almost exclusively for the past 30 years, the quality of the American product being superior to that of the foreign article. One of the finest grades of spelter is produced in New Jersey and is sold at a high price. At no time within the past 30 years has spelter been admitted to the United States free of duty. The duty under the McKinley Bill was one and a half cents per pound. Subsequently it was made one cent per pound and the duty at present is 15 per cent ad valorem.

On 13 Jan. 1801, Paul Revere, of Revolutionary fame, wrote to a friend in London, requesting him to go down to Maidenhead, where rolling machinery was manufactured, and ascertain the price of a pair of rolls 9 inches in diameter and 20 inches long, for making sheet copper. Colonel Revere was a silversmith, and had previously corresponded with Benjamin Stoddard, Secretary of the Navy, upon the subject of copper rolling. It is not known whether or not these rolls were procured at that time, but in January 1801, Colonel Revere purchased an old powder-mill at Canton, Mass., where he began the production of sheet copper. The business has been carried on continuously since that time, and is now incorporated under the name of the Revere Copper Company. Among the names of those originally connected with this enterprise are Joseph A. Revere, James Davis, John Revere and S. T. Snow. This company was finally consolidated with the Taunton-New Bedford Copper Company.

In 1812 the Soho Copper Company was established in Belleville, N. J., where there is a good water power and water transportation by canal and the Passaic River. The originator of this enterprise was Harmon Hendricks, the son of Uriah Hendricks, who was an importer of copper and metals. Some of the buildings were of brick, roofed with tiles imported from Europe. The rolling-mill was of wood and contained one pair of breaking-down rolls, one pair of sheet rolls and one pair of bolt rolls, all of which were imported from England. The plant and machinery cost $50,000, and were intended for the purpose of furnishing the United States government with heavy copper sheets for boilers and bolts for shipbuilding, during the War of 1812. This business has descended from father to son in a direct line, until it is now in the hands of the fourth and fifth generations, and is known as the «Belleville Copper Rolling Mills,» operated by Hendricks Brothers. In the year 1815 ingot copper sold for 18½ cents per pound and the price of copper sheets was 39 cents per pound.

The Gunpowder Copper Works were built in 1817 on the Gunpowder River, 10 miles from Baltimore, by Levi Hollingsworth. Water power was used in manufacturing. In 1866 the rolling-mill was transferred to Canton. It is now operated by the Baltimore Copper Smelting & Rolling Company, who are engaged in smelting and in the manufacture of blue vitriol and sulphuric acid.

The manufacture of yellow metal for sheathing vessels was the subject of a patent by H. F. Muntz, of Birmingham, England, about the year 1840. This mixture, which contains a large percentage of spelter and can be rolled while hot, being cheaper than copper, naturally came largely into use for ship-sheathing. It was first made in this country by the Revere Copper Company, within a year or two after its production in England. Later, it was made by the Taunton Copper Manufacturing Company, the New Bedford Copper Company and the Bridgewater Iron Company. The decline of American ship-building, and legislation permitting American vessels engaged in foreign trade to use the foreign metal without payment of duty, have greatly decreased the demand for yellow metal in the United States.

The causes that have tended to localize the manufacture of sheet brass do not affect the rolling of copper. The makers of sheet copper usually do not remanufacture their product. So that, while most of the brass-mills are located in Connecticut, the copper-mills are distributed throughout the country: in Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Michigan and Illinois.

The manufacture of seamless tubes of brass and copper is an important part of the brass business. These tubes are made in the Naugatuck Valley by The American Brass Company and also by the American Seamless Tube Company of Boston, and by other manufacturers. Early in 1848, Joseph Cotton, Joseph H. Cotton, William E. Coffin, Holmes Hinckley and Daniel F. Child, all of Boston, despatched to England an engineer, Joseph Fox, to learn how to make seamless brass tubes, paying a large sum to Messrs. Green and Alston, the English patentees, for the instruction of Mr. Fox, and the right to make tubes by their process in the United States. Previous to that time all copper and brass tubes for use in locomotive and marine boilers and for the hundreds of other uses to which tubes were put, were brazed: that is, made of strips of metal put in a rounded form and their edges brazed together. In 1850 the gentlemen before named organized a corporation called the American Tube Works, of Boston, and began the manufacture of seamless drawn brass tubes. Such tubes have taken the place of the brazed tubes in all cases where steam or other high pressures are involved.

There are no public records correctly showing the present condition of the brass and copper industry in America. Figures can only be obtained by personal application to the manufacturers. The following details, showing the state of the business in the year 1903, are taken from information furnished by 20 of the largest corporations, and include the entire business of the country in rolled brass, copper, tube and wire. In a few instances, where information was refused, an estimate of the business has been made, but this does not exceed 13 per cent of the total.

The nominal capital invested was $17,000,000, but the amount of the actual investment was about $29,000,000.

The average number of persons employed was 16,000.

The annual consumption of copper was 300,000,000 pounds.

The annual consumption of spelter was 43,500,000 pounds.

The value of the annual product was $73,700,000.

If the foregoing figures were doubled they would fall short of the amount invested and the extent of the industry in the year 1915. The increased volume of business is mainly supplied by extension of previously existing plants, but some corporations of more recent origin have come into prominence, notably the Buffalo Copper and Brass Rolling Mills of Buffalo, N. Y.

Brass founders or manufacturers of articles of cast brass are not included in the foregoing figures. That is a separate branch of business, and it is carried on by a great number of foundries in the United States, consuming a large quantity of ingot copper and of old metal. Many manufacturing concerns, also, have their own foundries, where metal is cast, to be used in their various departments.

Early in the year 1915 it became evident that a large quantity of copper and spelter would be required, by the mills of the United States, for use in the manufacture of ammunition for the warring nations of Europe, and the price of these metals rapidly advanced until, in 1916, copper was quoted at 34 cents per pound and spelter at from 18 to 30 cents according to the quality of the metal and the time of delivery, the highest price being paid for immediate requirements. Brass rolling-mills running day and night were unable to supply the demand for brass; existing mills increased their facilities; new mills were started; old and disused mills were put in operation; wages were advanced; labor became scarce and serious strikes occurred, for the first time in the history of the business. Brass rolling became very profitable and the shares of corporations engaged in that business doubled in value within a year.

In brass rolling-mills the copper is received in the form of ingots and the spelter in the form of plates which are broken when required for use. The copper is melted in crucibles and the spelter is then added in the proportion required, the standard mixture being about two parts copper to one part spelter. This mixture and those containing a higher percentage of copper are rolled and worked when cold. The combination of 60 pounds of copper with 40 pounds of spelter is known as yellow metal and is usually rolled while hot into sheets and rods. The melted brass is poured from the crucibles into sectional molds from which when cooled it is taken in the form of slabs, approximately of the width required for the finished product. These slabs are then reduced and elongated by passing through rolls of chilled iron. Frequent annealing is required between the successive passes and the oxide forming upon the surface of the metal in the process of annealing is removed by baths of dilute sulphuric acid. Brass rods are drawn from round bars by successive passes through dies on draw-benches. Brass wire is produced by drawing the metal through a succession of dies by means of revolving drums on which the wire is coiled. Seamless brass and copper tubes are usually cast in hollow form round a core and finished on draw-benches by drawing through dies over mandrels. Another process consists of piercing a bar of metal by a steel mandrel over which the metal is drawn by the action of conical rolls revolving at a high speed; the shell thus formed is then drawn into a tube in the ordinary manner. Brass rods and tubes of intricate shape are formed by a process of extrusion by means of which the metal, after being heated to a temperature of about 1,000° F., is placed in a cylindrical container at one end of which is the die and, upon pressure being applied at the opposite end by means of a hydraulic ram, the metal, which is in plastic condition, is forced through the die, issuing therefrom as rods or tubes of the required section and of a length governed by the quantity of metal placed in the container. In this way metallic sections are produced in complex designs with re-entering angles which it would be impossible to roll or draw. An admixture of brass and nickel produces the white metal known as German silver, used in the manufacture of spoons, forks and other articles which, when plated, have the appearance of silverware. Sheet copper and copper rods are rolled at a red heat from cast plates and bars and, when a fine surface is required, they are finished by cold rolling or drawing. In the rolling of brass and copper the accumulation of clean scrap metal is remelted and used.

Alfred A. Cowles,
Late Vice-President of The American Brass Company.

COPPER CLIFF, Canada, a town in the Sudbury district of Ontario, on the Sault Sainte Marie section of the Canadian Pacific Railway four miles west of Sudbury. The neighborhood is rich in copper and nickel. An electric railway now connects with Sudbury. Pop. 3,082.

COPPERAS, the commercial name for ferrous sulphate, or green vitriol. (See IRON). Its formula is $FeSO_4.7H_2O$. Copperas occurs native, as the mineral melanterite (q.v.), commonly in connection with deposits of pyrites, from which it is derived by oxidation.

COPPER, or ATNA, RIVER, a stream in Alaska, rising in the neighborhood of Mount Wrangell, flowing in a generally southerly direction west of that mountain, and emptying into the Gulf of Alaska about 30 miles west of Chilkat. The length of the river is a little over 300 miles. Its name is due to the alleged fact that its waters hold copper in solution. Its basin has an area of about 23,000 square miles. Its course reveals a reverse topography, for though it originates in a mountainous region, its upper course lies through a broad plain, while its lower course carries it through the Chugach Mountains. Consult Mendenhall, ‹Geology of the Central Copper River Region, Alaska› (in United States Geological Survey, House Document No. 197, Washington 1905).

COPPERFIELD, David. See DAVID COPPERFIELD.

COPPERHEAD (*Ancistrodon contortrix*), the most widely distributed, and in many places the most abundant of the venomous snakes occurring in the eastern United States. It belongs to the family *Crotalidæ* (q.v.), but with the water moccasin belongs to a genus (*Ancistrodon*), distinguished from the rattlesnakes by the absence of rattles, while the copperhead is peculiar in the presence of a small additional plate between the eye and nostril. The copperhead seldom exceeds a length of three feet. It is brown, with a series of dark blotches on the back, and the triangular head is a bronzy red, from which circumstance it takes its name, while the white color of the interior of the mouth has given rise to another of its names, that of cottonmouth, also applied to the water moccasin. It is sometimes called the red viper. Like other poisonous snakes the copperhead has been exterminated in the thickly settled parts of the northern States, but is still abundant in unsettled regions and in the South. It is partial both to the neighborhood of water and to dry rocky hills and, owing to its activity, its silent approach and its irascible temper, is justly feared by man and the lower animals, including non-venomous snakes. Some of the latter, as the blacksnake, will, however, attack and eat it. The customary food of the copperhead consists of small birds and mammals. About seven or eight young are produced at a time, this snake being viviparous; it is said that when pregnant a large number of females will sometimes twine themselves together, whence the epithet «contortrix.» As a poisonous snake the copperhead, as well as many harmless American snakes, is sometimes called an adder or viper, though in common with all related poisonous serpents of North America, it differs from the true vipers in the presence of the preorbital sensory pit. In England adder is the name applied to the only native venomous serpent, the *Pelias berus*.

COPPERHEADS, a name applied in 1862 and throughout the Civil War to members of the Democratic party in the northern States who violently opposed the prosecution of the War. They were not necessarily in sympathy with the South, but in all events they held that the Confederacy could never be conquered, and that the attempt to coerce the seceding States was hopeless and illegal. The name was generally indicative of a treacherous character, and was a reference to the habit of the copperhead snake, which strikes without warning. Another explanation of the name is that it came from the button cut out of a copper cent, on which was the head of the Goddess of Liberty, worn by the opponents of the war. The most prominent and obnoxious of the copperheads was Clement L. Vallandigham (q.v.).

COPPERMINE RIVER, in Canada, near Coppermine Mountain. It has its source in Point Lake and flows into Coronation Gulf, an arm of the Arctic Ocean, near Duke of York's Archipelago, lat. 68° N., long. 116° W. Its length is about 325 miles; but the large number of waterfalls along its course render it useless for any travel except by light canoes.

COPPICE. See COPSE.

COPPIN, Fanny Muriel Jackson, American negro educator: b. Washington, D. C., 1846; d. Philadelphia, 21 Jan. 1913. She was born in slavery and her freedom was purchased by an aunt when Fanny was about 12 years of age. At 15 she went to Newport, entered the service of the Calvert family, and in her spare time managed to acquire the rudiments of an education. Later she entered Oberlin College, and was the first colored woman in the United States to graduate from a recognized college. She taught a class in the preparatory department at Oberlin with conspicuous success and soon after the outbreak of the Civil War was called to the Institute for Colored Youth in Philadelphia, of which she became director in 1869. For 35 years her career in Philadelphia was one of intense activity, acknowledged ability as an educator and distinction as a leader in every good cause for the promotion of the betterment of the colored people of her city and the country at large. She organized the Colored Woman's Exchange, and an Industrial School as part of the Institute. In 1888 she visited England to attend the Missionary Congress and there most eloquently pleaded her cause. In 1881 she married the Rev. Levi J. Coppin, who in 1900 was elected bishop and assigned to work in South Africa. She resigned her connection with the Institute in Philadelphia and set about founding the Bethel Institute at Cape Town. The last months of her life were spent in preparing for the press her ‹Reminiscences of School Life and Notes on Teaching.›

COPPINGER, John Joseph, American military officer: b. Ireland, 11 Oct. 1834; d. 1909. After obtaining a military education in Ireland he went to Rome, serving in the papal army as aide-de-camp. He came to the United States in 1861 and was given a commission in the Union army, rising to the rank of brigadier-general in the regular army in 1895. In the war with Spain, as major-general of volunteers, he commanded the 4th Army Corps in Porto Rico. He married Alice, daughter of the late James G. Blaine (q.v.). He was retired in 1898.

COPRA, the dried kernel of the cocoanut, from which the oil has not yet been expressed, a considerable article of commerce in some tropical regions. Samoa and the Fiji Islands export more than 10,000 tons annually, Tahiti about 2,000 and Ceylon 3,000 tons. From it cocoanut oil and cocoa butter are manufactured, and the residuum after expression is an excellent fodder, with many of the nutritive properties of cottonseed-oil cake. Copra, either sun-dried or kiln-dried, contains 50–65 per cent of oil, while hot air dried may run as much as 74 per cent.

COPROLITES, the term originally applied to the fossil excrements of extinct animals, especially fishes and reptiles, found most abundantly in the lias, greensand and Suffolk crag. They consist chiefly of phosphates of calcium (from 50 to 75 per cent) and magnesium, and the carbonates of the same metals, and organic matter, and as the fertilizing properties of these are well known, coprolites have been largely used as a manure. For this purpose they are reduced to powder and used as ground bones, or treated with sulphuric acid, so as to form superphosphate of lime. To the scientist these remains have a definite value as indicating the prey of the animal in question and the nature of its intestinal structure.

COPSE, kŏps, a cultivated wood, where the trees are cut periodically, before they attain timber size, each succeeding crop being cut from the stumps of the first growth. A copse or coppice is sometimes used as an ornamental growth, where large trees would not be desirable, but their chief use is as a source of profit. When cultivated under the rules of scientific forestry, they may be made a very valuable adjunct to the farm lands. The practice is not common in America, where the idea of profit from woodland is that the land must be allowed to grow up to timber, and then be entirely denuded. In Europe, particularly in England, the most valuable tree thus employed is the oak, which is cut at intervals varying, according to soil and climate, from 12 to 30 years; and after paying all expenses it often yields from $150 to $250 per acre in bark used for tanning and in wood convertible into wheel-spokes, or applicable to other purposes. The stems, cut over near the ground, are carefully dressed and rounded, so as to prevent them from rotting; in a short time a number of shoots appear, all of which are thinned away except three or four of the most promising, which are left to grow till they again become fit for another cutting. When plantations are extensive, the method usually followed is not to allow all the copse to come to maturity at the same time, but to divide it into a number of sections and to cut one of them annually, so as to yield a revenue with as much regularity, and not infrequently to as large an amount as an equal quantity of land under cultivation. For instance, a copse of 100 acres, on the assumption that it may be profitably cut after 20 years' growth, is divided into 20 sections of five acres each. By cutting only one of these sections annually a perpetual succession of cuttings is obtained, yielding, on the most moderate calculation, a clear income of at least $500 per annum. The proprietors of many of the rocky glens of Great Britain, by pursuing this method, have materially increased the value of their estates. The other kinds of wood commonly used for copse are chestnut, which, from its durability, even when partly inserted in the ground, is valuable for posts, etc.; ash, preferred for all purposes where strength and elasticity are required; and hazel, admirably adapted for barrel hoops, and in great demand for crates in the vicinity of potteries. The willow, well known for its uses in basket-making, being cut down regularly after every year's growth, scarcely falls under the head of copse. In some continental countries the copse is the source of the whole fuel supply.

COPTIC LANGUAGES, the language formerly spoken by the Copts or Egyptian Christians and regarded as the direct descendant of the ancient sacred language of the Egyptians. As such it has afforded to Champollion, Dr. Young and others the key to the interpretation of the Egyptian hieroglyphic inscriptions. At the time of the introduction of Christianity among the Copts the hieroglyphic, hieratic and demotic modes of writing previously in use in Egypt were abandoned, and the Greek alphabet was adopted, with the addition of six characters of the demotic alphabet, which were retained because the equivalents to them were wanting in the Greek alphabet. These six letters represented *kh, h, f*, the English *j* and two forms of *sh*. By the time that this change was made the Coptic language was no longer the same with the ancient sacred language, but had adopted a number of words from the vernacular language which was spoken in Egypt alongside of the former, besides a large number of others from the Greek, the Latin, the Arabic and other sources. It still remained, however, essentially Egyptian. The Coptic language is monosyllabic in character. All its radical forms are monosyllables, and whenever a polysyllabic word is met with it may be at once affirmed that the word is either a derivative or a compound. As a rule the radicals are capable of certain modifications of form, which always express a modification also of the sense. The meaning of the radical monosyllables is in fact changed by the juxtaposition of other monosyllables, which are the usual signs of genders, numbers, persons, moods and tenses. The feminine is sometimes formed by a modification of the vowel of the masculine. In the Coptic root syllables there are often final consonants which do not form part of the root. These are called paragogic letters, and can only be explained as instances of the caprice of pronunciation, or as being originally part of the root both in spelling and pronunciation, although in course of time they have been dropped so far as the pronunciation is concerned. According to the German philologist, Schwartze, the Coptic may be taken as forming a family of languages analogous to the Semitic in its grammar, and allied to the Indo-European languages in its roots. This opinion is supported by various other philologists, such as Bunsen, Meier and Bötticher, but it is contested by others, among them Pott, Ewald, Wenrich and Renan.

The Coptic language is divided into three dialects — the Theban, which was spoken in Upper Egypt, and which is the best preserved of the three; the Memphitic, or Coptic, strictly so called, which was spoken in Lower Egypt; and the Bashmuric, which was spoken in the Delta. Of the last the literary remains are very scanty, but it is that which comes nearest to the hieroglyphic language of the ancient Egyptians. After the Arabian conquest of Egypt the Coptic language gradually ceased to be spoken, and as early as the 10th century it was no longer in use in Lower Egypt, except in their church liturgies; in Upper Egypt, however, it maintained itself for some centuries longer, but here also it was at last obliged to give way to the Arabic. The theological writings in use among the Coptic Christians, however, are still written in the Coptic language, but an Arabic translation always accompanies them. In the schools the children learn the Gospels and the epistles of the New Testament in Coptic as well as Arabic, but they are no longer taught the former language grammatically. In the various libraries of Europe there are numerous Coptic manuscripts, but most of them are of little interest. The Coptic literature is almost entirely of a religious character, the works written in it comprising portions of the Old Testament, the Acts, sermons and homilies, martyrologies, etc. Translations of the Pentateuch and some other books of the Old Testament and of the Gospels into Coptic have been published at Rome. One of the most valuable discoveries of Coptic literature — practically the whole library of the old Coptic monastery of Saint Michael in the Egyptian Fayyûm, was acquired by the late J. Pierpont Morgan in 1911, and placed by him in the J. Pierpont Morgan Library in New York city. It consisted of 50 volumes, and these are being edited for publication by Professor Hyoernat of the Catholic University of Washington. The larger part consists of manuscripts of books of the Bible of the 2d century of our era, and the remainder of liturgical books and treatises by the old monks of Alexandria. These are the oldest manuscripts known, and the fine bindings are the choicest and oldest existing in any library. Materials for the study of the Coptic language will be found in the grammars of Schwartze (Berlin 1850), Uhlemann (Leipzig 1854), and Stern (Leipzig 1880), and the dictionaries of Peyron (Turin 1835, still considered the best) and Parthey (Berlin 1844). Consult Loret, 'Manuel de la langue égyptienne.'

COPTINE, a colorless alkaloid which is said to have been found together with berberine in the root of *Coptis trifolia*. Coptine dissolves in sulphuric acid, the solution becoming purple-red when heated; it gives a crystalline precipitate with a solution of mercuric potassium iodide.

COPTIS, a genus of low herbs of the crowfoot family (*Ranunculaceæ*.) It comprises about nine species occurring in the cooler parts of the northern temperate zone. Four species are found in America, three of them on the Pacific Coast. *C. trifolia*, gold-thread or canker-root, grows in damp woods and bogs from Newfoundland to Maryland, and westward and north to Minnesota, British Columbia and Alaska. Its common name of canker-root is given to it because of its use in household medicine as a cure for cankerous affections of the mouth in children. A yellow dye is extracted from the slender yellow root stock. *C. teeta* is used in India as a tonic.

COPTS, a name given to the schismatic Christians of Egypt who are of the Monophysite sect, similar in belief with the Jacobites of Asia. The Monophysites and Jacobites are followers of Dioscurus, patriarch of Alexandria, who was deposed by the Council of Chalcedon in 451, because he maintained there was only one nature in Christ. The Copts were of pure Egyptian blood, and at first were more numerous than their adversaries, the Melkites, who were Greeks in origin and believers in Christ as taught by the Church. Officials who were considered orthodox were sent from Constantinople to govern Egypt, and many of the Copts fled to Upper Egypt and some went to the Arabs. So incensed were they with their rulers that when an opportunity occurred, they betrayed their country to the Saracens, who drove the Greeks and Romans out of the land. But the Copts soon found that their privileges would be of little avail, and their wealth, numbers and respectability rapidly declined, and though rarely intermarrying with their conquerors, and preserving their features, manners and religion unaltered, they soon lost their language, which had resisted the influence of a Grecian court for so many ages. In person and features the Copts differ much from the other natives of Egypt, and are evidently a distinct race. According to the younger Champollion they are the result of a mixture of all the different races that have ruled over Egypt. Reduced by a long course of oppression and misrule to a state of almost degradation, their number and national character have declined; their number was estimated in 1907 at 706,322. Their costume resembles that of the Moslems, but they are in the habit of wearing a black turban for distinction's sake. They also commonly wear a black or dark-colored outer robe. In their general customs there is little to distinguish them from the other inhabitants of the country. They are chiefly employed as clerks, secretaries, etc. The women go out with veiled faces, like the other females of the country. They have numerous schools for their male children, but very few of the females are taught to read. In doctrine they agree almost wholly with the Roman Catholic Church, except on the one point which caused the separation,— the two natures in Christ. They celebrate mass in the old Coptic language, as with them now the Arabic is the common tongue. Their supreme head is the Monophysite patriarch of Alexandria, who is chosen from among the monks; then come the bishops, priests, deacons, inferior clergy and monks. The priests may be married according to the Eastern discipline, and as they receive but little by way of support from their congregations, they are generally engaged in the ordinary occupations of the place in which they live. (See JACOBITE CHRISTIANS; MELCHITES). They have four seasons of fasting, all of which are scrupulously observed. Their Lent begins nine days earlier than that observed by the Roman Catholic Church. The doctrine of the sacraments does not vary from that of the Latin

Church, but they have a peculiar ritual in the administration of the sacrament of extreme unction, which they give with the sacrament of penance, even when there is no bodily illness, to heal the disease of the soul. The curious custom exists of blessing the bathing water stored in large tanks; and to appease or please the Mohammedans, they have adopted circumcision. Within recent years a large body of the Copts made corporate reunion with the Roman Catholic Church, and there is a Catholic Vicar Apostolic of the Coptic rite for the Copts of Egypt.

The Coptic language flourished from the 3d to the 16th century, but is now extinct as a vernacular. It is of great linguistic importance because of its descent from the Ancient Egyptian. Its literature is of little importance; it borrowed extensively from Greek and Latin but is free from any admixture of Arabic. It was divided into five principal dialects — the Sahidic and Achmimic in Upper Egypt, the Boheiric and Memphitic in Lower Egypt, and the Fayumic, or so-called Bashmuric in Central Egypt. The Sahidic is the liturgical dialect of the Coptic Church and in it is contained by far the greater amount of the Coptic literature extant.

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COPY (Lat. *copia*, «abundance»). (1) In ancient times, when the art of printing in its improved form was unknown, the copyist was a much esteemed person, and manuscript was multiplied by the laborious process of writing by hand. Some of the Roman slaves were copyists. From the early centuries of Christianity through the Middle Ages, and until the art of printing became popular, there were in each monastery certain monks who were copyists. Their whole time was occupied with transcribing manuscripts of the ancient classics, the writings of the fathers and doctors; but their chief care was the making of copies of the Bible. Often days were spent upon ornamenting an initial letter or in decorating the names of the Deity. The preservation of the Bible in its present form, and of ancient classics in general, is due to the faithful work of the old copyists. Copies of books in those days were of great value, often they were carried under guard from place to place when the owner was traveling, and the copy of the Bible was usually chained in the parish church. (2) The matter, whether in print or manuscript, sent to the printer to be set up in type. (3) An exact reproduction of a work of art made by one other than the original artist; a copy made by the original artist is called a replica; a copy of statue or other piece of sculpture, taken from a mold, is called a cast.

COPYHOLD, in English and Irish law, a tenure of estate by copy of court roll, or a tenure for which the tenant has nothing to show except the rolls made by the steward of the lord's court. Copyhold property cannot be now created, for the foundation on which it rests is, that the property has been possessed time out of mind, by copy of court roll, and that the tenements are within the manor. The method of conveyance of such property is by surrender and admittance, i.e., the holder surrenders it to the lord of the manor, whose steward, on receiving a fee, transfers the copyhold to the person in question, who again swears fealty. The heirs must pay the fee of admittance in order to retain the property. Copyhold land may be converted into freehold by agreement between the lord and the occupants; and the lord or tenant may, by paying a fixed sum or an annual rent (the amount to be fixed by commissioners), compel the enfranchisement of the copyhold. Copyhold does not exist in the United States. Consult Scriven, ‘Treatise on Copyhold, Customary Freehold,’ etc. (7th ed., 1896).

COPYING, a term in general use for a great many different processes, which may be described generally as the reproduction, usually either on an enlarged or reduced scale, of any drawing, map or other work of art. A few of the methods employed may be shortly described. If the copy is to be the same size as the original, the easiest way is to trace it. A piece of tracing-paper is put over the drawing, and the principal lines gone over with pencil. The back of the tracing is then rubbed with black lead or ruddle, and put on the paper on which the copy is to be made; the traced lines are gone over with a hard point, and thus indicated on the paper. Guided by the traced lines, the copy can then be drawn in. When the copy is required of a different size from the original, the simplest way is to sketch it by hand and eye but where more mechanical accuracy is required, the method of squares is very useful. The original is covered with squares of any convenient size by pencil lines or threads or by tracing paper ruled off in squares; a piece of paper for the copy is prepared with a corresponding number of squares, of a smaller or larger size, according as the copy is wanted smaller or larger. These squares must bear the same proportion to the squares on the original as the copy is to bear to the original. It is then a comparatively easy matter to copy in each square the part of the original in the corresponding square. To avoid confusion if the squares are small, it is well to number them along each side of the drawing. Any drawing consisting principally of straight lines, such as a plan, can be conveniently reduced by constructing a scale to suit the reduced size required. The lines of the original are measured by its scale, and the same proportion of the smaller scale gives the necessary measurement. The pantograph is another means of making a reduction or enlargement, but is very seldom used now. It is only accurate in a general way. Perhaps the simplest and most exact method is to get the original photographed to the required size; the copy can then be traced on to clean paper as already described.

The copying of letters and other documents for commercial purposes is usually done by means of the ordinary copying-press, which is so familiar in every counting-house as to need no detailed description. A letter written with specially prepared ink is transferred to another piece of paper by means of damp and pressure. Common ink thickened with a little sugar will serve as copying ink. Many modifications of this arrangement have been devised for producing a number of copies of circulars, etc., from one written copy, and are known as «graphs.» A document written with the ink prepared for the purpose is transferred by pressure with the hand to a gelatinous slab, from which as many as 50 or 60 copies, more or less distinct, can be retransferred by rubbing with the hand. A very useful method of manifold writing is largely employed in telegraphic news work, and for duplicating invoices by retail tradesmen. Carbonized paper is put between two, three or more sheets of thin paper, and thus whatever is written on the top sheet with a hard pencil is duplicated on the others. When an indefinite number of copies or any drawing or other subject is required, there are many printing processes which may be employed. Letters or circulars, if written with lithographic ink, can be transferred to stone, and any number printed. Engineers' or architects' drawings, or any other drawing executed in line, can be very successfully reproduced in any size by the photo-lithographic process, which depends on the action of light on citrate of iron and prussiate of potash. (See PHOTOGRAPHY). If required for block or letterpress printing, then any of the zincotpye processes may be employed. By this process, also, plates to reprint steel-engravings can be produced from any printed engraving. For reproducing drawings executed otherwise than in line, photographs from nature, or paintings, there are many other processes.

COPYING MACHINE, any one of a number of contrivances by which one or more copies of a letter or other document may be made. Perhaps the best known is the copying-press. The letter is written with «copying ink,» a writing fluid containing some gummy substance which prevents the ink from soaking into the paper. A sheet of bibulous tissue paper moistened with water to a certain degree is laid on the face of the writing, a sheet of oiled paper is laid on the tissue paper and the letter is placed between boards and put into a press, the platen of which is screwed down tightly. A few seconds' contact of the damp tissue paper with the writing transfers sufficient of the ink from the original to the tissue to make a perfect copy. A number of letters similarly treated may be copied by one operation of the press, and by the use of very thin tissue and longer impression three or four good copies of a letter may be taken. Among copying processes are many that are perhaps rather methods of reproduction in bulk instead of copying in a more limited way, being somewhat akin to printing. Among these are lithography (q.v.) and the mimeographic process. The mimeograph consists of a stylus, moving over a sheet of tissue paper, coated on one side with some sensitive material. This paper is placed on a steel plate, upon the surface of which are cut intersecting corrugations. When the stylus is moved over the paper, it presses the latter down on the corrugations and these pierce the paper along the line of writing. The paper is then placed on a perforated cylinder; ink is forced through the perforations of the cylinder and paper is fed to the cylinder, as in any small printing press. The ink coming through the perforated line on the special paper makes a print on the sheets of paper fed to the cylinder and an indefinite number of copies may be struck off. The paper film is also adapted so that it may be placed on an ordinary typewriter, the ink ribbon of the latter is removed and the stencil is cut by the type bars operated in the ordinary manner. The stencil is then placed on the printing cylinder and copies made in the manner described above for the stencil cut by the stylus.

COPYRIGHT, the exclusive right of property in any intellectual production; the protection afforded by the law for a limited number of years to the originator of any written or printed composition or work of art, or to his heirs and assigns, whereby persons unauthorized are prevented from multiplying and selling copies, or, in case of dramatic works, from representing them on the stage. Such rights were claimed by authors before the introduction of printing. After the invention of the printing press, the right to publish books became the subject of licenses and patents. In Chambers' 'Domestic Annals of Scotland,' under date of 9 Nov. 1699, may be seen a warrant of the Privy Council authorizing George Mossman, stationer in Edinburgh,—

> —"to print and sell the works of the learned Mr. George Buchanan, in one volume in folio, or by parts in lesser volumes, and forbidding all others to print, import, or sell the whole or any part of the said Mr. George Buchanan's works in any volume or character, for the space of 19 years."

Similar privileges were granted in England; but all such monopolies were regarded with suspicion by common lawyers. The common law affords a certain measure of protection to works unpublished or published only for a limited purpose. The writer of a letter, for example, transfers his property in it to the receiver; but the receiver has no right to print it for sale or distribution without the writer's consent. The copyright in published works is the creation of statute; the first copyright act was passed in 1709; and by virtue of its provisions authors acquired the sole liberty of printing their books during a term of 14 years from first publication, and, if the author should be living at the end of that time, during a further term of 14 years.

While this act was in force, Thomson sold the copyright of his poems to Millar, a London bookseller. Millar claimed the right to prevent the issue of reprints by Donaldson (of Edinburgh) and others, even after the statutory term had expired, on the ground that an author had, at common law, the sole right of printing his works. Out of this dispute arose the famous cases of Millar *v.* Taylor, and Donaldson *v.* Beckett, which led to a remarkable difference of opinion among the judges. The House of Lords decided that if any common-law right existed it had been taken away by statute.

At the union with Ireland, the copyright act was extended to that country, and the trade in cheap editions printed in Dublin and secretly imported into Great Britain came to an end. In 1814 the term of copyright was extended to 28 years, and the residue of the author's life if he were living at the end of the term. The impetus given to literature at the beginning of the 19th century, and especially the popularity attained by the works of Scott and Byron, greatly increased the market value of copyright, and ultimately led to further legislation in the interest of authors and publishers. The basis of the existing law is the copyright act of 1842, commonly known as Talfourd's Act, or Lord Mahon's Act. Macaulay's speech in the House of Commons on the second reading of this measure is one of his most successful parliamentary efforts. In Great Britain the term of copyright in a book is 42 years, or the life of the author and seven years, whichever of the two terms is the longer. No copyright can be enjoyed in seditious or immoral publications, or in books first published out of the United Kingdom. Articles contributed to encyclopædias and periodicals and books published in parts or series belong to the proprietor; but he may not publish them separately without the writer's consent, and after 28 years the copyright reverts to the author. Dramas and musical pieces, if first published in book-form, are subject to the same rules as books; but if they are performed in public before appearing in print the author retains the sole right of permitting them to be presented during the term of copyright; and this right is distinct from the copyright he acquires if his drama or piece is published as a book. By an act of 1882 the proprietor of a piece of music, desiring to reserve the right of performance, must give notice to that effect on the cover. Verses may not be taken from a copyright work and set to music for sale, without permission. A novel may be dramatized without the author's permission; but if copies of the drama are published containing passages borrowed in substance from the novel, the author of the adaptation is liable to an action. The right to dramatize can be exercised only with precautions which must greatly restrict it in practice.

Copyright in engravings, maps, etc., is secured by several acts; the term is 28 years. Each plate and print must bear the name of the proprietor. Copyright in paintings, drawings and photographs is secured to the artist during his life and seven years after, by an act of 1862. In 1874 the Canadian Copyright Act enabled a British author to obtain copyright in Canada for 28 years, provided his work be published in the colony. This right is concurrent with and in addition to the rights given by the Imperial Act of 1842.

Prior to the enactment of the first Federal Copyright Law, the various States of the Union had individual copyright laws, having in view the same general purposes, expressed in the Federal Act, that is, to secure to authors or publishers of new books the copyright of such books, and for the encouragement of literature and genius, which laws, generally speaking, followed a resolution of the United States Congress passed 2 May 1783, recommending that the several States secure to the authors and publishers of books and publications the exclusive benefits derived from the sale of such publications for a limited period. By virtue of the authority of the Constitution of the United States 17 Sept. 1787, Art. 1, Sec. 8: «The Congress shall have power to promote the progress of science and useful arts, by securing for limited times to authors and individuals, exclusive right to their respective writings and discoveries.»

The act of 1790 made it possible to secure copyright protection for copies of maps, charts and books, and by an act of 29 April 1902, the benefits of copyright were extended to the arts of designing, engraving and etching, historical and other prints, and there have been many subsequent acts enlarging the scope of the copyright act, and providing for reciprocal protection of copyright matter, with various foreign countries.

Under the authority of the Constitution, as above mentioned, Congress, on 4 March 1909, passed an act to amend and consolidate the previous acts respecting copyright. This act of 1909 was amended 24 Aug. 1912, 2 March 1913, 28 March 1914, which acts are now in force, and upon complying with their various provisions, the exclusive right to print, reprint, publish, copy and vend the copyright work, to translate the copyrighted work into other languages, or dialects, to make other versions of it if it be a literary work, and to dramatize it if it be a non-dramatic work; to convert it into a novel or other non-dramatic work if it be a drama, to arrange it or adapt it if it be a musical work; to complete, execute and finish it if it be a model or a design for a work of art; to deliver or authorize the delivery of the copyrighted work in public for profit, if it be a lecture, sermon, address or similar production; to perform or present the copyrighted work publicly, if it be a drama, or if it be a dramatic work, and not reproduced in copies for sale; to vend any manuscript, or any record whatsoever thereof; to make or to procure the making of any transcription or record thereof by or from which, in whole or in part, it may in any manner or by any method be exhibited, performed, represented, produced or reproduced; and to exhibit, perform, represent, produce or reproduce it in any manner or by any method whatsoever, and to perform the copyright work publicly for profit if it be a musical composition, and for the purpose of public performance for profit; or to print, reprint, publish, copy and vend any arrangement or setting of it or of the melody of it in any system of notation or any form of record, in which the thought of an author may be recorded, and from which it may be read or reproduced.

Books, including composite and cyclopedia works, directories, gazetteers and other compositions, periodicals, newspapers, lectures, sermons, addresses (prepared for oral delivery), dramatic or dramatico-musical compositions, maps, works of art, models or designs for works of art, reproductions of a work of art, drawings or plastic works of a scientific or technical character, photographs, prints and pictorial illustrations, motion picture photoplays, motion pictures other than photoplays, are by acts of 1909, 24 Aug. 1912, 2 March 1913 and 28

March 1914, made the subject matter of copyright protection.

Prior copyright laws required samples of the object upon which copyright protection was sought, to be marked with copyright notice and filed with the Librarian of Congress, before publication. The present Copyright Act of 1909 permits publication of the matter for which copyright is claimed prior to filing with the Register of Copyrights at Washington, D. C. No copyright is valid unless «Notice» of the claim is placed in some manner upon the article or object in which copyright protection is sought. Publication by a person entitled to the benefits of the act, with the copyright notice thereon, «secures» to such person the copyright, and the notice must be affixed to each copy published or offered for sale in the United States by the proprietor, or with his authority, except in case of books seeking «ad interim» protection. The copyright proprietor may obtain registration of his claim to copyright, after publication with the notice of the claim thereon, by filing promptly with the Register of Copyrights two complete copies of the best edition then published, except in the case where the work is by an author who is a citizen or a subject of a foreign state or nation and has published in a foreign country, in which case one complete copy of the best edition then published in the foreign country may be filed. Should the copyright proprietor after publication with notice fail to file the necessary copies with the Register promptly, the Register may, at any time after publication of the work, upon actual notice, require the copies to be deposited, and if the demand is made and not complied with within three months from any part of the United States except an outlying territorial possession of the United States, or within six months from any outlying territorial possession of the United States, or from any foreign country, the proprietor of the copyright will be liable to a fine of $100 and to pay to the Library of Congress twice the amount of the retail price of the best edition of the work, and the copyright shall become void.

Books, including composite and cyclopedic works, directories, gazetteers and other compilations, periodicals, which include newspapers, except the original text of a book of foreign origin, or in foreign language other than English, must be printed from type set within the limits of the United States, or from plates made within the limits of the United States, and if the text is produced by a lithograph process or photoengraving process, the processes must be performed within the limits of the United States, and the printing and binding must be done in the United States. These requirements extend to illustrations in books and illustrations produced by lithographic process or photoengraving process and to separate lithographs or photoengravings, except where the subjects represented are located in a foreign country, and illustrate a scientific work, or reproduce a work of art. These requirements do not apply to works in raised characters for the use of the blind, or to books of foreign origin in other than the English language.

Upon filing application for copyright a fee of $1 is required, for which the Register makes an entry of the copyright and issues to the proprietor or claimant a certificate of registration under seal. Where the copyright protection is sought on photographs, and where no certificate is required or demanded by the applicant, a fee of 50 cents is charged.

Copyright protection endures for 28 years from the date of first publication, and a renewal term of 28 years may be had upon application for an extension made within one year prior to the expiration of the original term of copyright, and this right of renewal not only applies to the author himself, but to the widow, widower or children of the author, if the author be deceased, or if such author, widow, widower or children be not living, then to the author's executors, and in the absence of a will, the next of kin to the author is entitled to the renewal and extension of a copyright under the same provisions as to filing application for renewal that characterizes the original application.

If the owner of a copyright has complied with all of the requirements of the law, in obtaining the copyright and has a certificate of registration, he may bring suit for infringement of the copyright, the remedy being in the way of an injunction restraining such infringement and damages which have been suffered by the copyright proprietor due to the infringement, as well as all profits which the infringer shall have made, for such infringement, or in lieu of actual damages and profits, the court may assess such damages as it may think the infringement warrants.

No action for copyright infringement can be maintained until the copyright protection is completed by the insurance of a certificate of registration, and the claimant must have marked or given notice of claim of copyright in the manner prescribed by the law.

The notice of copyright required, if the work be a printed literary, musical or dramatic work, is «Copyright» or abbreviated «Copr.» accompanied by the name of the copyright proprietor, and the notice must include also the year in which the copyright was secured by publication, or when it was first published. Certain subject matter of copyright productions, maps, works of art, models or designs for works of art, reproductions of work of art, drawings or plastic works of a scientific character, photographs, prints and pictorial illustrations, may be marked with the letter «C» enclosed within a circle, thus —©— accompanied by the initials, monograms, mark or symbol of the copyright proprietor, provided that on some accessible portion of such copies of the margin, back, permanent base, pedestal or of the substance on which such copy shall be mounted, the name of the copyright proprietor appear, except in cases where a copyright subsisted when the act of 1909 went into force, or 1 July 1909, in which cases the notices prescribed by prior acts are sufficient.

What is called «ad interim» copyright protection may be obtained for a book published abroad in the English language or before publication in this country by deposit of one complete copy of the foreign edition in the copyright office in the United States at Washington, not later than 30 days after its publication abroad, with request for reservation of the name and nationality of the author and of the copyright proprietor and of the date of publication of the book, and such protection will endure for 30 days after the deposit in the American office, and if an authorized edition of such book is published within the United States within the 30-day period, and the copyright act is otherwise complied with, the protection will be extended to endure for the full term provided by the copyright act.

Copyrights secured under the provisions of the copyright act may be assigned, granted or mortgaged by an instrument in writing signed by the proprietor of the copyright, or may be bequeathed by will, but where an assignment is made, it must be recorded in the copyright office within three months after its execution in the United States or within six months after its execution outside of the limits of the United States, otherwise it will be void as against any subsequent purchaser or mortgagee for valuable consideration without notice, whose assignment has been duly recorded. Under the copyright act, original jurisdiction is given the District Courts of the United States and the District Court of any territory and the Supreme Court of the District of Columbia and the District Courts of Alaska, Hawaii, Porto Rico and the Courts of First Instance of the Philippine Islands. Where the article to be copyrighted comes properly under the head of «Label» or «Print» which comprises artistic matter, for use upon merchandise or for advertising merchandise, it is registrable in the United States Patent Office by complying with certain rules and regulations made by the Commissioner of Patents, but the label or print must have upon it, when first published, the copyright notice as prescribed by the copyright act. The authority for this Patent Office registration is contained in the act of 18 June 1874, relating to the registration of prints and labels, and section 3 of the act is not repealed by the copyright act of 4 March 1909, or any acts in the interim between 18 June 1874 and 1909, and it provides that no prints or labels designed for use on any other articles of manufacture shall be entered under the copyright law, but may be registered in the Patent Office.

Until 1891, copyright could be acquired only by a citizen of, or permanent residence in, the United States. British and other authors had much reason to complain of this state of the law, and American authors were injured by having to compete with cheap, unauthorized reprints of foreign works, but this condition no longer exists, and there is in most instances a very good understanding between the United States and foreign nations in copyright matters.

Foreign Works.—There was at one time an understanding that the American publisher who first placed a British work on the market obtained copyright by courtesy; and considerable sums were paid for «advance sheets» in order to obtain this advantage, but the «courtesy of the trade» came to be disregarded. In December 1887, the convention of Bern brought nearly all the states of Europe into copyright relations with one another. This was the most important step ever taken in the history of the world's literary dealings, for it secured an almost universal recognition of the rights of authors.

The rights of citizens or subjects of foreign nations to copyright in the United States may be extended by presidential proclamations, and now Americans can secure copyright in all foreign countries with which we have reciprocal copyright arrangements, and in consequence a citizen or subject of a foreign state or nation may obtain copyright protection upon copyrightable matter when such alien is domiciled within the United States and his work is published for the first time in the United States, or, as just suggested, when the foreign state or nation of which such author or proprietor is a citizen or a subject grants, either by treaty, convention, agreement or law, to citizens of the United States the benefits of copyright on substantially the same basis as to its own citizens, or copyright protection substantially equal to the protection secured to such foreign author under the United States act, by treaty, or when such foreign state or nation is a party to an international agreement which provides for reciprocity in the granting of copyright, by the term of which agreement the United States may, at its pleasure, become a party thereto.

Presidential proclamations have been issued upon this basis permitting citizens or subjects of the following foreign states and nations to obtain copyright protection in the United States: Canada, Great Britain and British possessions, France, Belgium, Germany, Luxemburg, Sweden, Switzerland, Italy, Greece, Tunis, Hungary, Denmark, Portugal, Spain, Netherlands and possessions; Norway, Japan, China, Korea, Austria, Mexico, Costa Rica, Cuba, Guatemala, Salvador, Honduras, Nicaragua, Argentine Republic, Brazil, Dominican Republic, Panama, Ecuador, Bolivia and New Zealand. For an American citizen to secure copyright in Great Britain the title should be entered at Stationers' Hall, London, the fee for which is five shillings sterling, and five shillings additional if a certified copy of entry is required. The work must be published in Great Britain or in her dominions simultaneously with its publication in the United States, and five copies of the publication are required, one for the British Museum and four on demand of the Company of Stationers for four other libraries. Copyright may be secured in France by a foreigner by depositing two copies of the publication at the Ministry of the Interior at Paris. No fee or entry title is required. To secure copyright in Belgium a foreigner may register his work at the Department of Agriculture, Industry and Public Works at Brussels. The term is the life of the author and 50 years after death except in cases of foreign authors, then the term is limited not to exceed that granted in the home country. In Switzerland register of title at the Department of Commerce and Industry at Bern is optional, not obligatory; fee two francs. If registered, deposit of one copy is required. The term is the life of the author and 30 years after death. Works published by corporate body 30 years from publication. Photographs five years from registration. Copyright in Canada is to be registered with the Minister of Agriculture at Ottawa; fee $1 for registry and 50 cents for certificate, and the work must be published in Canada and two copies deposited. The term is 28 years with renewal of 14 years or 42 years in all.

In Greece the period during which an author can hold a copyright is restricted to 15 years. The Swiss grant copyright during the life of the author or his heirs during 30 years from the date of publication of his work. In Brazil, the term of copyright is 50 years from publication. In Venezuela the copyright is perpetual. In Holland the copyright lasts 50 years after publication. In Hungary and Portugal, copyright endures for the life of the author and 50 years after his death. In Germany and Austria copyright endures during the life of the author and during 30 years after his death. The duration of copyright in Italy is regulated in a peculiar manner. It endures for the life of the author and 40 years after his death, or for 80 years after the publication of the work, the term of years being divided into two periods of 40 years each. If the author dies within the first period of 40 years the remainder of the term is enjoyed by his heirs or assigns. The second period of 40 years begins at the death of the author, if he has died after the first period of 40 years has elapsed; or if he has died before them, at the end of the first period of 40 years. During the second period any one is at liberty to republish the work on payment to the owner of the copyright of a royalty of 5 per cent on the price, which must be marked on the book. France, Norway, Sweden and Denmark accord a copyright during the life of the author and 50 years after his death. Russia not only gives copyrights for life and 50 years after death, but also for 10 additional years if an edition of the work is published within five years from the end of the first copyright term. The law of Spain accords a copyright during the life of the author and for 80 years thereafter. In Mexico copyright is perpetual.

Consult Drone, 'The Law of Property in Intellectual Production'; Putnam, 'The Question of Copyright'; United States Copyright Law of 4 March 1909, and Copyright Laws of the World.

Revised by TITIAN W. JOHNSON, *of the Washington Bar.*

COPYRIGHT, Canadian. The double relation of Canada, as at the same time a self-governing nation, and also a part of the British Empire, produces some slight complications in its copyright law. By the British North America Act of 1865, constituting the Dominion, the power of copyright legislation was assigned to the Federal authority. The Canadian Parliament passed a Domestic Copyright Act in 1875, revised it in 1886 and amended it in 1889 by an act which was suspended by the Imperial Parliament, pending discussion of the protection of British authors. Finally in 1895 a Canadian act satisfactory to both British authors and the Canadian printers and publishers was agreed on and passed. The Imperial Copyright Act of 1842 applies generally to Canada, subject to the present Canadian legislation. The British Copyright Act of 1911 applies only to such of the Dominions as adopt it by legislative enactment, and this has not been done in Canada. The importation of foreign reprints of British copyright works was formerly permitted on payment of a 12½ per cent royalty duty collected through the Canadian Customs, but since this has been dropped from the tariff, it has been held (*re* Morang vs. Publishers' Syndicate, 32 Ont. Rep.) that the prohibition of such importation contained in the Imperial Act applies once more to Canada in favor of the properly registered British copyright holder. The point is not, however, free from dispute.

The difficulties have chiefly arisen from the importation into Canada from the United States of reprints of British works sold at low prices, and which it has been practically almost impossible to restrain. When these were so imported by American publishers under agreement with the British author, the Canadian printer and publisher saw themselves constantly deprived of business which they considered should be theirs, as no reciprocity was permitted them by the United States. Their mouthpiece was the Canadian Copyright Association and their agitation was continuous. The refusal of the United States to enter the Bern Convention was an important incident in the history of the trouble, although more recent United States legislation protects the British author to a certain extent. The Canadian author also has found it necessary to watch copyright legislation and raise some complaints. At present any author domiciled in the Empire, or in any country having an international copyright treaty with the United Kingdom, may obtain copyright in Canada for 28 years (renewable for 14 years by the author, his widow or children) of any book, map, chart, musical composition or any original painting, drawing, statue, sculpture or photograph, any print or engraving of an original design, or any translation of a literary work; but no exclusive right can be obtained to illustrate a piece of scenery or an object. The work must be printed and published, reprinted and republished or produced or reproduced in Canada. The copyright lapses with the expiration of foreign copyright. British copyrighted works may be copyrighted when printed and published, or reprinted or republished in Canada, and may also be imported notwithstanding Canadian copyright. Works published in separate articles of a periodical may be temporarily copyrighted but the complete work must also be registered when published. Anonymous works may be registered in the publisher's name. The registration is granted on delivery of three copies of the work at the Department of Agriculture (Copyright Branch), Ottawa, immediately on publication in Canada, and the issued work is to bear copyright notice in due form. A copy must also be sent to the Library of Parliament, Ottawa, and one to the British Museum, London. An interim copyright may be obtained, but becomes void unless the work is printed in Canada within one month after first publication elsewhere. All communications are addressed to "The Minister of Agriculture (Copyright Branch), Ottawa," from whom copies of the act and regulations may be obtained on request.

Any publication of an original manuscript without consent of author or proprietor entrains liability for damages, unless the work be already printed in Canada or elsewhere. If the copyright edition is out of print the minister may, after a complaint made to the proprietor, and his neglecting to provide a remedy, grant licenses to others to publish, and may fix the royalty.

Foreign magazines and newspapers, containing British copyright works, may be imported, if the publication is with the author's consent, or under the copyright law of the country from which they come. Volumes of collections containing in part literary matter or music copyrighted in Canada cannot be imported except from the United Kingdom.

William Douw Lighthall,
Fellow Royal Society, Canada.

COQUELIN, kŏk-lăṅ, **Benoit Constant,** French actor: b. Boulogne, 23 Jan. 1841; d. France, 26 Jan. 1909. He is known as Coquelin Ainé, to distinguish him from his younger brother, Coquelin Cadet. He early gave promise of great dramatic ability. He was admitted to the Paris Conservatoire in 1859, the following year took the second prize for comedy, and made his début on the stage of the Théâtre Français, 7 Dec. 1860, as Gros-René in 'Le dépit amoureux.' Later he appeared with great success in 'Le Mariage de Figaro,' 'Le malade imaginaire,' 'Le misanthrope,' 'Le barbier de Seville,' and other pieces in the classical repertoire. His versatility was considered remarkable, as he was no less effective in modern plays, and he speedily became a popular favorite. He was elected a sociétaire in the Théâtre Français in 1864, but in 1886 he retired and made an extensive tour abroad. He made his first visit to America in 1888. About the end of 1889 he rejoined the Théâtre Français company as a salaried member and remained with that organization until 1892. In 1893–94 he again appeared in the United States. Upon his return to Paris he formed an engagement with the Renaissance Theatre, which led to a lawsuit with the Comédie Française in which Coquelin was condemned to pay damages. In 1900–01 he visited America again, in company with Sarah Bernhardt (q.v.), to whose Duke de Reichstadt he played Flambeau in Rostand's 'L'Aiglon.' Among the many characters created by M. Coquelin in later years are those of Labussière in 'Thermidor,' Cyrano de Bergerac in Rostand's play of that name, and Napoleon in 'More than Queen.' He was without a rival among his contemporaries. His versatility and mastery of technique were unequalled. He entered into the soul of the part he was playing and his simplicity and directness made a great appeal to his audience. Together with his high rank as a comedian M. Coquelin became celebrated as an author and lecturer, among his publications being 'L'Art et le comédien' (1880), which has been translated into German and into English (as 'The Actor and his Art'); 'Les comédiens par un comédien' (1882), and 'L'Arnolphe de Molière' (1882), and in collaboration with his brother, 'L'Art de dire le monologue' (1884). Consult De Amicis, Edmondo, "L'attore Coquelin" (in 'Ritratti letterari', 3d ed., Milan 1881); and Zabel, E., "Coquelin im Berliner Schauspielhause" in 'Zur modernen Dramaturgie,' Vol. III, Oldenburg 1903).

COQUELIN, Ernest Alexandre Honoré, French actor; brother of Benoit Coquelin: b. Boulogne, 16 May 1848; d. Suresnes, 8 Feb. 1909. He was educated at the high school of his native city and was for a time in the employ of the Northern Railway, but following in the footsteps of his brother went to Paris in 1864 and entered the Conservatoire, to make a career upon the stage. He was graduated three years later with the first prize in comedy and made his début at the Odéon. In 1868 he became associated with his brother at the Théâtre Français, and continued there until 1875, playing in all the well-known classical comedies. He took an engagement at the Variétés in 1875, but returned to the Théâtre Français in the following year, shortly after becoming a member of the company. He created the parts in 'Le sphinx,' 'L'Ami Fritz,' 'Les corbeaux,' 'Denise' and 'L'Héritière.' M. Coquelin, Cadet, as he was called, to distinguish him from his greater brother, was the author of numerous monologues, to the success of which he owed most of his reputation, and his rendering of them gained him great popularity in Paris. Under the nom-de-plume of Pirouette he published 'Le livre des convalescents' (1880); 'Le monologue moderne' (1881); 'Fariboles' (1882); 'Le rire' (1887); 'Pirouettes' (1888), etc.

COQUELIN, Jean, French actor: b. 1 Dec. 1865. He is a son of B. C. Coquelin (q.v.), and adopting his father's rôles appeared at the Comédie Française for the first time, 20 Nov. 1890. In 1897 at the Porte-Saint-Martin he created the rôle of Ragueneau in 'Cyrano de Bergerac.' Other famous rôles were Lubin in 'Thermidor'; Verdelet in 'Le gendre de M. Poirier' and Talleyrand in 'Plus que reine' (1899).

COQUEREL, kō'krĕl', **Athanase Josué,** French Protestant clergyman: b. Amsterdam, 16 June 1820; d. Fismes, Marne, France, 24 July 1875. He was a son of A. L. C. Coquerel, and was the author of 'Jean Calas et sa famille' (1858) 'Libres études' (1867); 'Des Beaux-Arts en Italie' (1857), etc. He was widely known as an eloquent preacher, and was long a leader of the liberal Protestant party in France. Consult Stroehlin, 'Athanase Coquerel, fils' (2 vols., Paris 1886).

COQUILLA NUT (Sp. *coquillo*, "little coconut"), the seed of the piassava or piassaba palm, *Attalea funifera*, one of the coconut group, a native of Brazil. The nuts are three or four inches long, oval, of a rich brown color and very hard, and are used in turnery for making umbrella handles, etc. They are known as vegetable ivory. The imports of the United States, which were valued at about $1,000,000 in 1913 and amounted to in the neighborhood of 30,000,000 pounds, are mainly from Ecuador, Colombia and Panama. Vegetable ivory is coming into increased use. See Attalea.

COQUIMBO, kō-kēm'bō, **Chile,** a province situated in the northern part of the republic, between the provinces of Atacama and Aconcagua. Area 14,098 square miles. It is divided into the departments of Serena, Elqui, Coquimbo, Illapel, Ovalle and Combarbalá. The principal towns are La Serena, the capital (pop. 17,578); Coquimbo, the principal seaport of the province, which is one-half hour by rail from the capital, and has 12,106 inhabitants; Ovalle (5,500); Elqui (2,500); Illapel and Combarbalá. Gold, silver, copper, iron, quicksilver, lapis lazuli and lime are found. There are four large copper-smelting establishments, and several others for silver and gold ore. Natural pasturage is abundant. Agricultural products in excess of the needs of the province are exported in considerable quantities. Vineyards are located near the mountain range and wines and brandies are produced. Two lines of railway belonging to the government and one belonging to a private company are in operation; the total length of the government lines being about 200 miles. There are telegraph and telephone services throughout the province, and at La Serena and Coquimbo are offices of the submarine cable. There is also a wireless station at Coquimbo. Pop. 183,787.

COQUIMBO, Chile, a seaport. See Coquimbo, a province.

COQUIMBO. See Burrowing Owl.

COQUINA, kō-kē'na, a porous rock found in Florida, where it is used for building purposes. It is composed of the broken shells of sea animals and coral cemented together.

COR ANGLAIS, kôr än-glā' (Fr. «English horn»), a wind instrument of the reed kind, similar to the oboe, and possessing a compass of like extent but of lower pitch. Its compass is from E in the bass to B flat above the treble staff. In Bach's works it appears as the Oboe di Caccia. Its effective wailing tone has caused it to be used by modern operatic composers.

CORACIIFORMES, an order of birds comprising a somewhat miscellaneous group, formerly designated as «picarian.» Nearly all are arboreal, and are characterized by comparatively short and weak legs, and by usually nesting in holes. They include the rollers, niotmots, todies, kingfishers, bee-eaters, hornbills, etc. (*Coraciæ*); the owls (*Striges*); the nightjars (*Caprimulgi*); the swifts (*Cypseli*); the mouse-birds (*Colii*); the trogons (*Trogones*) and the woodpeckers (*Pici*). See Ornithology.

CORACLE, kŏr'ạ-kl, or **CURRACH** (Ir. *curach;* W. *corwe*), a kind of ancient boat, constructed with a frame or body of wicker-work, and still in use among Welsh fishermen and on the Irish lakes. It is covered by skins, oil-cloth, etc., which are removed when out of use. It is of an oval form, and generally contains but one man, who, on reaching the shore, shoulders his coracle, and deposits it in a place of safety, or carries it perhaps where he may again make use of it. Cæsar (De Bello Civili, i, 54) describes coracles which he made after the British model for use in Spain. The coracle or currach is mentioned in the lives of Saint Patrick, Saint Columba and in accounts of travels made by Scots and Picts.

CORACOID, kŏr'ạ-koid (Gr. «crow-shaped,» that is, like a crow's bill), an important paired-bone in the breast-girdle, forming, along with the scapula, the articulation for the forelimb, and always lying ventrally. In the lower fishes the entire girdle is cartilaginous. In the bony fishes distinct coracoids first appear. They are well seen in *Amphibia* and in all reptiles except snakes, and are very large and strong in birds; but they become mere processes of the scapula in mammals. They very often exhibit a special anterior portion known as the precoracoid.

CORAL AND CORAL ISLANDS, the solid support or skeleton of the coral polyps. (See Polyps). It was formerly supposed that the coral was a calcified portion of the soft parts of the animal, but this has been disproved. Recently Bourne has proved by examination that the skeleton is formed as a secretion by certain cells and that there is no deposition of crystalline carbonate of lime in the actual cells. The calcareous septa or partitions are deposited by the soft septa of the animal in the radial chambers. The coral particles begin to be deposited in the embryo polyp before it becomes fixed to the bottom. In the very young polyp of the Mediterranean Astroides, as soon as it becomes stationary 12 calcareous partitions are deposited, and these enlarge and finally become jointed to the external walls (theca) of the coral, forming a groundwork or pedestal, on which the young polyp rests, as if on a limestone foundation. If isolated needles or rods of lime are distributed beneath the outer layers of the polyp-stock, the latter becomes horny or leathery and more or less flexible, as in the alcyonarian polyps. The entire skeletal mass is called the corallium or coral-stock. In the common red coral (*Corallium rubrum*) of the Mediterranean, the solid unjointed coral-stock has a thin cortical layer of spicules in which the polyps are retractile.

Coral-like masses, encrusting reefs, are also formed by the animals of the hydroid millepore, which may be distinguished by the multitude of minute cells or openings, much smaller than those of any genuine coral polyp. See Millepore.

The simpler, most primitive corals, are cup-shaped, forming a single calicle or corallite, containing but one polyp, as in the early Paleozoic cup-corals, and the existing species of Flabellum, *Caryophyllia* and *Deltocyathus,* which live buried in the mud in deep cold water in all seas, from Greenland to the tropics.

Microscopic Structure of Coral.— There are two kinds. In the aporose or poreless corals such as Flabellum, Astræa and the like, the coral-stock is throughout its mass solid and stony. In the perforate kinds, such as Madrepora, all parts of the corallium, including the connecting cœnenchym, or common calcareous stock or stem, has a structure like a meshwork, consisting of delicate rods of carbonate of lime so united as to leave interstices, which in the living coral are traversed by a network of interlacing tubes, representing the cœnosarc.

Rate of Growth Corals.— Little is known regarding the rapidity of growth in corals. A specimen of *Mœandrina labyrinthica,* measuring a foot in diameter and four inches thick in the most convex part, was taken from a block of concrete at Fort Jefferson, Tortugas, which had been in the water only 20 years. Hunt calculated that the average growth of a *Mœandrina* observed by him at Key West was half an inch a year. Verrill states that a *Madrepora* found growing on the wreck of the ship *Severn* grew to a height of 16 feet in 64 years, or at the rate of three inches a year. See Polyp.

Coral Islands.— The reef-building corals are the *Madrepora* and *Mœandrina,* the latter dome shaped and massive. They are confined to waters in which through the coldest winter months the temperature does not fall below 68° F., though usually the water is warmer than this, the mean annual temperature of the north Pacific being about 73.5° F., and of the south Pacific 70° F. Coral reefs are abundant in the West Indies and occur on the coast of Brazil as far south as Cape Frio, but still more so on the central Pacific. None occur on the western coast of Europe and Africa and the two Americas. In depth reef-building species do not occur below 15 to 20 fathoms. Coral reefs are divided into fringing, barrier and circular reefs, or atolls. Fringing reefs encrust the shores on which they grow. Barrier reefs have a lagoon between the reef and the main land. A fringing reef may ultimately become a barrier reef either by a sinking of the land and the successive upbuilding of the seaward face of the reef, or by gradual dying of the coral polyps next to the land where they do not get enough fresh water and food, the stony skeleton being redissolved while the outer part of the reef continues to grow. Atolls are roughly circular, with a central lagoon, with or without central islands. Contrary to the views of Darwin and Dana, it has been found by A. Agassiz that modern coral reefs form as a rule but a thin crust, those of Florida not more than from 50 to 75 feet in thickness; yet Tertiary reefs and those geologically older may be much thicker. According to Darwin and Dana atolls were supposed to have been formed on submarine banks over a subsiding sea-bottom, first starting as a fringing reef about an island or slightly submerged peak. After they had grown to the surface, the inner face of the reef could not get food, and ceased to grow. As the island or peak gradually sank, the outer face of the reef grew up in a ring. Owing to the observation of Semper, Agassiz and others, it is now evident that atolls may be deposited under any conditions, whether the sea-bottom be stationary, rising or subsiding. We will, however, have to hold on to the Darwin subsidence theory to account for coral reefs over about 100 feet in thickness, since corals do not grow at greater depths than this. From his prolonged explorations in the West Indies and the Pacific Ocean, A. Agassiz concludes that the barrier reefs of Fiji, the Hawaiian Islands and the West Indies usually flank volcanic islands and are underlaid by volcanic rocks. Those of New Caledonia, Australia, Florida, Honduras and the Bahamas are underlaid by outliers of the adjoining land-masses, which crop out as islands and islets in the outer edge of the barrier reefs. Some of the barrier reefs of the Society, Fiji and of the Carolines, show that the wide and deep lagoons, separating them from the main islands, have been formed by erosion, from a broad, fringing reef-flat, as explained above.

The reef-flats and outer reefs flanking elevated islands are partly barrier and partly fringing reefs. We may, says Agassiz, trace the passage of elevated plateaus like Guam, Tonga and some of the Fiji islands, which are partly volcanic and partly limestone, to atolls where only a small islet or a larger island of either limestone or volcanic rock is left to indicate its origin. Atolls also may be formed upon the denuded rim of a submerged volcanic crater, as in certain of the Fijis (Totoya and Trombia), and as in some of the volcanoes east of Tonga.

As to the origin of atolls by subsidence, we really have few data to support the Darwinian theory. Agassiz claims that throughout the Pacific, Indian Ocean and West Indies «the most positive evidence exists of a moderate, recent elevation of the coral reefs.» This is shown by the ridges, pinnacles and undermined masses of modern or Tertiary limestones formed recently beneath the sea, but now above sea-level, proving very recent uplift. The existence of honeycombed pinnacles of limestone within the lagoons of atolls, as shoals, islands or islets, shows the extent of the solvent action of the sea upon land areas having formerly a greater extension than at the present day. The Maldivian plateau with its thousands of small atolls, rings or lagoon reefs, rising from a depth varying from 20 to 30 fathoms, is overwhelming testimony, says Agassiz, that atolls may rise from a plateau of suitable depth, wherever and however it may have been formed, and whatever may be its geological structure. In the regions examined by Agassiz the modern reef-rock is of every moderate thickness, being within the limit of depth at which reef-builders begin to grow and within which the land rims of atolls or of barrier reefs are affected by mechanical causes.

Why no coral reefs exist on the western coasts of the two Americas, and their absence at other points, is explained by Agassiz as due to the steepness of their shores and to the absence or to the crumbling nature of their submarine foundations or platforms. Coral reefs also cannot grow off the steep cliff-surfaces of elevated, coraliferous limestone islands.

The proof of the supposed great thickness of coral reefs, to account for which Darwin invoked subsidence, will be ascertained by boring. Thus far the evidence tends to show that the coral beds are not continuous. At Honolulu they contained several beds of volcanic ash, etc. In the Fiji Islands, shell limestones were interstratified with coral rock. The great areas of subsidences postulated by Darwin and by Dana have been shown to be areas of elevation. The deepest depressions or «deeps» in the Pacific, judging by the *Challenger* maps, are in regions where there are no coral reefs or atolls.

Bibliography.— The literature of the subject is extensive. The classic works are J. D. Dana's magnificent folio in the series of reports of the Wilkes Exploring Expedition, and his more popular volume, ‹Corals and Coral Islands› (revised edition, New York 1890); and Darwin's ‹Structure and Distribution of Coral Islands› (London, 3d ed., with notes by Bonney, New York 1899). Murray's papers of corals and reef-structures in the ‹Proceedings› of the Royal Society of Edinburgh, Vols. X (1880) and XVII (1891) are highly important. The Agassizs, father and son, directed much attention to this subject, and Alexander Agassiz in particular has added greatly to information in his ‹Visit to the Great Barrier Reef of Australia› (Cambridge, Mass., 1898). The illustrated works of Saville Kent on the Australian reefs should also be remembered, as well as Heilprin's on those of Bermuda. For structure and classification consult Bourne's account of the Anthozoa in Lankester's ‹Treatise on Zoology› (London 1900); and for fossil corals consult Zittell-Eastman, ‹Text-book of Palæontology› (New York 1900), and the great ‹Monographie des polypiers fossils des terrains paléozoiques› of Milne-Edwards and Haime, issued in Paris in 1851; also Hickson, «Cœlenterata» (in Cambridge Natural History, Vol. I, London 1906). See BARRIER REEF, THE GREAT.

CORAL FISHES, a name given to several fishes of different genera belonging to the *Chætodontidæ*. They are found in all tropical seas, especially about coral reefs, and are all brilliantly colored. The most important is the *Holacanthus imperator,* the "emperor of Japan," which measures about 15 inches in length and is the most esteemed of all the Indo-Pacific fishes.

CORAL ISLANDS. See CORAL.

CORAL SEA, part of the Pacific Ocean northeast of Australia and between it and the New Hebrides. It extends between the parallel of 25° S. and Torres Strait. The numerous coral islands fringing the northeast of Australia and other islands washed by this sea give it its name. In 1874 the *Challenger,* when making soundings in these waters, found the Coral Sea, in some places, to be 14,700 feet deep. The coral growths of the great barrier reef lie along its western boundary.

CORAL SNAKE, a small venomous colubroid snake of the same family (*Elapidæ*) as the cobra. The typical genus (*Elaps*) is a strictly American one. The usual color is rich red with black and yellow transverse bands, making these among the most brilliantly colored of snakes. Owing to the position of the poison-fangs and the small size of the mouth they are, although venomous, usually unable to injure man. One species, the harlequin or bead snake (*E. fulvius*), occurs in the southern United States as far north at least as Virginia. It is a beautiful snake, about two feet or more long, and is less feared than it should be. Most of the remaining species, including the typical *E. corallinus,* are confined to tropical South America and the West Indies.

CORAL TREE, leguminous plants of the genus *Erythrina,* which has about 50 species. They are shrubs or trees with trifoliolate leaves and racemes of scarlet flowers. The long pods enclose bright red seeds. They are mostly tropical, natives of America, Africa and India. One species (*E. herbacea*) is common throughout the southeastern United States, and two more are found in Florida. The plants are much cultivated in greenhouses. An Indian species (*E. indica*) is said to have been stolen by Krishna, the Hindu deity, from the gardens of paradise. This is a spiny plant, and is planted for hedges. This species and *E. caffra* (the kaffir-boom of Africa) furnish soft light wood valuable for industrial purposes.

CORALLINE, kŏr'ą-lin, a term popularly applied to sea-weeds with rigid calcareous fronds and also to certain of the zoophytes. The coralline algæ are mostly purple and gradually grow paler and whiter as the season advances. Their habitat is commonly pebbly rocks, to which they cling fast. *Corallina officinalis* has been employed as a vermifuge.

CORALLINE, or **PÆONINE,** an orange-red color prepared by the action of ammonia, at about 300° F., upon rosolic acid, or upon the washed residue of the action of a mixture of sulphuric, oxalic and carbolic acids. It differs from magenta in both its tint and its permanency, not being affected by light or by alkalis; but, on the other hand, fabrics dyed with it are readily turned yellow by acids. It is insoluble in water, but dissolves in alcohol with a very rich color. This solution, mixed with soda and a large quantity of water, and tartaric acid added, is employed for dyeing silk. It is also printed upon cotton by means of albumen. The use of this dye has been much restricted on account of its alleged poisonous properties.

CORAM, Thomas, English philanthropist: b. Lyme Regis, Dorsetshire, about 1668; d. London, 29 March 1751. He was bred a seaman, and rose to be a merchant captain. In 1694 he settled in Taunton, Mass., and engaged in benevolent work of various kinds. A few years after he returned to sea, and settled in London, after suffering shipwreck off Cuxhaven in 1719. In London he interested himself in the settlement of Georgia, and in planting English artisans in Nova Scotia; but soon began his long agitation for the foundation of a foundling hospital in London, which was at length opened in 1740. Coram's portrait was painted by Hogarth, a warm patron of his scheme. More thoughtful for others than for himself, Coram fell into poverty, from which he was relieved in 1745 by an annuity contributed by his friends.

CORANACH, kŏr'ą-năk, or **CORONACH,** a dirge or lamentation for the dead formerly customary among the Celts of Scotland and Ireland. The coranach is commonly known in Ireland as the caóine (Br. keen), a song of mourning for the dead. This funeral song, or dirge, was usually sung by professionals who had power to improvise and who told of the pedigree, worth, deeds and death of the deceased. In Scotland the weird, mournful notes of the bagpipes added sadness. The custom of having the caóine or coranach at wakes and funerals has fallen into disuse in both Ireland and Scotland. Frequent mention of the custom may be found in the writings of Sir Walter Scott, Lover, Davis and other writers. Consult Crocker, Crofton, 'Researches in the South of Ireland'; Jamieson, 'Etymological Dictionary of the Scottish Language' (revised by Longmuir and Donaldson, Vol. I, p. 494, under "Coranich," Paisley 1879).

CORANDAGOS, kō-răn-dä'gōs, **ISLANDS,** Philippines, group of islands lying off the northeastern coast of Palawan. The group consists of two islands, Corandagas and Dalangamen, and three islets. The inhabitants, of Malayan race, are mostly engaged in fishing and in the search for edible birds' nests. Pop. about 300.

CORATO, kō-rä'tō, Italy, city in Apulia, about 50 miles southeast of Foggia. The modern city is of little importance, the chief industries being cattle raising and the manufacture of leather and tartar. Near the city are the ruins of the famous Castel del Monte, built by Frederick II, which is one of the most beautiful of the architectural remains of the Middle Ages in Italy. The general plan is a vast octagon, with eight hexagonal towers. The windows are pointed and round arched, and the vaulted halls are supported by triple shafts of marble. It is the chief attraction of the city. Pop. 45,307.

CORBAN, kôr' ban, a term used by the Jews to signify a thing given to the Deity. (Lev. ii, 4, 12, 13, etc.) Such an object was sacred and set apart from profane use. It often was used to designate an oblation to God and has reference to a Talmudic formula, by which, under pretense of dedicating a thing to God, a person might prohibit the use of it by another person. Thus a son might declare his property as corban and avoid the obligation of using it for the support or need of a parent. This interpretation was rebuked (Matt. xv, 5 and Mark vii, 11), and also by some of the more tolerant and wiser rabbis.

CORBEIL, kôr'bä'yè, France, a town in northern France, in the department of Seine-et-Oise, at the junction of the Essenne with the Seine, 18 miles south-southeast of Paris. It has various manufactures, chiefly of paper, clocks, cotton and linen; and there are large grain-mills and a copper-foundry in the town. Pop. 10,746.

CORBEL, kôr'bĕl, in architecture, a piece of stone, wood or iron projecting from the vertical face of a wall, to support some superincumbent object. Corbels are of a great variety of forms, and are ornamented in many ways. They are of frequent occurrence in pointed architecture, forming the supports of the beams of floors and of roofs, the machicolations of a fortress, the labels of doors and windows, etc. A cornice supported by a series of corbels is styled a corbel table. Similar contrivances are the bracket and cantilever (qq.v.).

CORBETT, Julian Stafford, English lawyer and author: b. Surrey, 12 Nov. 1854. He was educated at Marlborough and Trinity College, Cambridge, and was called to the bar in the Middle Temple in 1877. He practised his profession until 1882 and has since given his attention to literary pursuits. He has published ‹A Business in Great Waters›; lives of Monk and Drake in ‹English Men of Action› series; ‹Drake and the Tudor Navy›; ‹The Successors of Drake›; ‹England in the Mediterranean›; ‹England in the Seven Years' War›; ‹The Campaign of Trafalgar›; ‹Some Principles of Maritime Strategy›; ‹The Spencer Papers.›

CORBETT, Lee Cleveland, American horticulturist: b. Watkins, N. Y., 21 Oct. 1867. He was educated at Cornell University, where from 1891 to 1893 he was assistant horticulturist. He was professor of horticulture and forestry at the South Dakota Agricultural College in 1893–95 and at the West Virginia University from 1895 to 1901, and then he became horticulturist in the United States Department of Agriculture. His publications include ‹Garden Farming› (1913); ‹Intensive Agriculture› (1913); and the following experiment station bulletins: ‹Pruning› (1903); ‹Cranberry Culture› (1903); ‹The School Garden› (1904); ‹Tomatoes› (1905); ‹Raspberries› (1905); ‹Beans› (1907); ‹Cabbages› (1911); ‹Ice Houses› (1911); ‹Tomato Growing as Club Work in the North and West› (1913).

CORBIE STEPS, CORBEL STEPS, or **CROW STEPS**, steps into which the sides of gables from the eaves to the apex are broken. They form a common feature in Scottish architecture, into which they were probably introduced from France. They are also to be seen in many old houses in Holland, Flanders and Germany, where they are even more general, especially in the north.

CORBIN, Caroline Fairfield, American writer: b. Pomfret, Conn., 9 Nov. 1835; married C. K. Corbin of Chicago, 1861. She has published ‹Our Bible Class and the Good that Came of It› (1860); ‹Rebecca, or Woman's Secret› (1866); ‹His Marriage Vow› (1874); ‹Belle and the Boys› (1879); ‹Letters from a Chimney Corner› (1886); ‹A Woman's Philosophy of Love› (1892).

CORBIN, Henry Clark, American soldier: b. Clermont County, Ohio, 15 Sept. 1842; d. New York, 8 Sept. 1909. He studied law, and entered the Union army as second lieutenant in the 83d Ohio Volunteer Infantry, 28 July 1862; but before the organization was completed he was assigned to the 79th Ohio Volunteer Infantry, serving therein as second and first lieutenant, respectively, until 14 Nov. 1863, when he was appointed major of the 14th U. S. Colored Infantry. In the following year (4 March 1864) he was promoted to lieutenant-colonel, and 23 Sept. 1865, made colonel of the 14th United States Colored Infantry. He was honorably discharged from the volunteer service 26 March 1866, with the brevet of brigadier-general, which honorary rank was bestowed upon him in recognition of meritorious services. In 1866, upon the muster-out of the volunteer army, and upon the recommendation of his military commanders, he was commissioned (11 May 1866) second lieutenant in the regular army. He was appointed to a captaincy of the line 31 Dec. 1866, and from that year to 1876 he was continually in command of his company on the Western frontier in campaigns against hostile Indians.

He was appointed to the adjutant-general's department 16 June 1880, and served therein nine years in the grade of major, seven years in the grade of lieutenant-colonel and two years in the grade of colonel; and was, when appointed brigadier-general and adjutant-general of the army (25 Feb. 1898), the senior in the corps; having served on the staffs of Generals Hunt, Schofield, Terry, Crook, Miles (with whom he participated in the Sioux Indian campaign), McCook, Ruger, Merritt, and in 1891 conducted a successful campaign against the Moqui Indians in Arizona Territory.

During the Spanish-American War, General Corbin was brought into close relations with President McKinley and was by him consulted upon all questions of policy relating to military affairs; and in addition to his duties as adjutant-general of the army he superintended the organization of 250,000 soldiers, and within six months the muster-out of 100,000. Subsequently 35,000 additional volunteer forces were mustered, equipped and made effective for the Philippine service, and they in turn disbanded — the regular army having been increased during this period to three-fold its former strength. In recognition of his services and of the part which he took in the war, the Congress of the United States conferred upon him the rank of major-general and adjutant-general in the army of the United States. He was in command of the Division of the Philippines in 1904–06, when he was made a lieutenant-general, and retired.

CORBIN, John, American dramatic critic writer, son of Caroline F. Corbin (q.v.): b. Chicago, Ill., 2 May 1870. He was educated at Harvard University, and at Balliol College, Oxford. From 1897 to 1900 he was assistant editor of *Harper's Magazine;* was member of the editorial staff of the Encyclopedia Britannica 1900–02; in 1902 he wrote the dramatic notices of the New York *Times,* and in 1905–08 those of the New York *Sun.* From 1908 to 1910 he was literary manager of the New Theatre, during the short life of which his efforts contributed much toward notably artistic productions. Since 1912 he is secretary of the Drama Society. Besides magazine stories and articles on the drama, he is author of ‘The Elizabethan Hamlet’ (1895); ‘Schoolboy Life in England’ (1898); ‘An American at Oxford’ (1902); ‘A New Portrait of Shakespeare’ (1903); ‘The First Loves of Perilla’ (1903); ‘The Cave Man’ (1907); ‘Which College for the Boy?’ (1908); ‘Husband and the Forbidden Guests’ (1910); ‘The Edge’ (1915).

CORBIN, Ky., city in Whitley County, 80 miles southeast of Lexington, on the Louisville and Nashville Railroad. It contains large railroad repair shops, a wood working factory and some coal mines. The waterworks are the property of the municipality. A Catholic academy is the principal educational institution. Pop. 2,589.

CORBOULD, kôr'bôld, **Edward Henry**, English water-color painter: b. London, 5 Dec. 1815; d. 18 Jan. 1905. He was a member of the Institute of Painters in Water Colors and was teacher of drawing and painting to the children of Queen Victoria, 1851–72, who acquired many of his more noteworthy productions, which were chiefly water colors. He also attained celebrity as a book illustrator.

CORCHORUS, kôr'kō-rŭs, a genus of the linden family (*Tiliaceæ*). There are about 35 species, mostly herbs or small shrubs, natives of Europe and Asia, and diffused in warm and tropical regions. The leaves of *C. olitorious* are used in Egypt and adjacent countries as a pot herb. From the fact that the Jews thus employ them they are sometimes called Jews' mallow. More important, however, is *C. capsularis*, which has long been cultivated for its fibre in China for Chinese hemp, also in India and other Eastern countries for making fish lines and nets, gunny bags, rice bags and «tat,» a coarse kind of linen-like cloth. This and the former species have much more recently been used to furnish jute (q.v.). The negroes in the West Indies use *C. siliquosus* to make coarse brooms, and an infusion of its leaves as a substitute for tea. The Japanese shrub, erroneously called *C. japonicus* by gardeners, is a common garden plant on account of its pretty double yellow flowers.

CORCORAN, William Wilson, American banker and philanthropist: b. Georgetown, D. C., 27 Dec. 1798; d. Washington, D. C., 24 Feb. 1888. He was educated at Georgetown College and established himself in the banking business in Washington in 1837. He became very wealthy and was widely known for his charities and gifts to the public. In 1847 he gave the Oak Grove Cemetery property to Georgetown, founded the Louise Home for Indigent Women in Washington in 1870, and gave to the city of Washington the famous art collection known as the Corcoran Art Gallery. This he endowed munificently and it is now housed in a marble building designed by Ernest Flagg and erected 1894–97. The collection contains fine specimens of early American painters, an admirable collection of Barye bronzes and the well-known ‘Greek Slave’ by Hiram Powers. A free school of art is connected with the institution and biennial exhibitions of contemporary American painting contribute greatly to its usefulness. Consult Henderson, ‘The Art Treasures of Washington.’

CORCORAN ART GALLERY. See Corcoran, William Wilson.

CORCYRA, kôr-sī'rạ. See Corfu.

CORD-GRASS, or **MARSH-GRASS** (*Spartina*), a genus of perennial grasses containing several species, widely dispersed in America, Europe and Africa. They are often maritime; with creeping rootstocks, simple stems and long tough leaves. The spikelets carry one flower, which has unequal glumes. Fresh-water cord-grass (*S. michauxiana*) is found along river banks, lake shores and brackish coast marshes over the northern part of the United States. It is grown for binding sand and river banks, and when cut early makes fair but coarse hay. It has been used successfully for making twine and paper. It is also used for thatch. Fox-grass (*S. patens*) is rather slender and somewhat wiry, and is abundant on salt marshes; with black grass (*Juncus gerardi*) it furnishes most of the salt hay these meadows produce. It is used for packing glassware, etc. Creek-sedge, thatch, or salt marsh-grass (*S. glabra*) grows along ditches and creeks of the Atlantic and Pacific coasts. It flowers from July to October, and is used for making ropes. When young it is eaten by stock.

CORDAGE. This is the general name for all manufactures of string, twine, cord, lines, rope, hawsers and cables made of twisted fibres. Fibres are first combed out or drawn into parallel position, and then a few are twisted together forming yarn or thread. Two or more yarns twisted together oppositely form a strand. Two or three small strands twisted form string or twine. A thick string is termed a cord, and three or more cords laid together form a rope. There is no fixed and accepted definition of the terms cord and rope, however. Some manufacturers use the word rope for all diameters of an inch or more, and some begin at the half inch. The public speak of a half-inch clothes*line*, and the mariner calls small ropes *lines*. It therefore appears that small ropes are called cords and lines indiscriminately. The manner of twisting the cords to form a rope determines the lay. Three ropes are laid together to form a hawser and three hawsers a cable. The common lay consists of three strands or cords, but a shroud-laid rope has a core about which three other strands are laid. Binder twine is made with a right-hand twist, but rope-yarn requires both right-hand and left-hand twists. Ropes have to be lubricated to keep them from wearing out by their own internal friction, and also to keep out the moisture which would invite rot. Sometimes tallow or graphite with fish-oil is used, but tar is the cheap and common lubricant. In making tarred rope the yarn is unwound from bobbins to coppers, and in its travel dipped in hot tar, being then passed between rollers to squeeze out the excess of tar and spread it uniformly. Where nine-thread and larger yarn is used the tarring is usually deferred, being applied in the completed rope. Wire ropes are not a part of the cordage industry. (See Telpherage). Although rope-making constituted one of the most important branches of business from the earliest days of the American colonies, like almost all the local manufactures, it was many years before it began to develop sufficient strength to entitle it to be regarded as an industry. The first rope-walk in America was constructed at Boston by John Harrison in 1642, just 12 years after the town had been founded, and prior to this time, all such products that had been required in the making of rigging and tackle were either brought direct from England by the captains of the various vessels, or were imported into this country for sale. In fact, it was not until the Boston shipbuilders had commenced the construction of the 160-ton *Trial* that the several advantages to be derived from a local rope-walk were fully appreciated, and it was at their instigation that Harrison, a Salisbury rope-maker, was invited to come to Boston, where he set up his «rope-field,» 10 feet 10 inches wide, on the land adjoining his house on Purchase street, at the foot of Summer street. At this time such work was done out of doors. Posts large enough to permit of the making of the largest sizes of rope then in use were firmly fixed in the ground in open fields, and upon these the cords were suspended and the ropes made.

Harrison's coming to Boston had been largely due to the fact that he was assured that he should have a monopoly of the business for a term of 21 years, and when, at the end of that time, the town officials gave permission to a John Heyman to «set up posts,» the fact that the latter was restrained in business to the «libertie onely to make fishing lines,» did not prevent the older rope-maker from protesting against what he considered the invasion of his rights. Accordingly Heyman's license was revoked, and Harrison had everything his own way up to the day of his death.

With the «original» rope-maker dead, however, the business began to extend its influence into other parts of the town. Rope-walks multiplied in number most rapidly in the West and North Ends, until there were finally no less than 14 of them. In 1793, an additional impetus was given to the business by the action of the general court in granting a bounty for American-made rope. On 30 July 1794, the date of the great fire, seven rope-walks were destroyed, and the selectmen, who had been flooded with protests from citizens who objected to this business being carried on in the heart of the town, refused to grant further licenses except upon the low lands west of the Common. As the result, six large rope walks were immediately constructed at that point. They ranged from 20 to 24 feet in width and were each about 900 feet in length. Destroyed by fire in 1806, five of them were rebuilt, only to be burned again in 1819. During the first year of the mayoralty of the elder Quincy, the walks were removed still further out of town for the purpose of improving the neighborhood around the Common, but by the latter part of the 18th century the industry had assumed such proportions that it was generally admitted that «the men employed in this work outnumbered any other class of mechanics in Boston.» At this time the work in the rope-walks was performed by hand, the method having been described by Longfellow in his poem, 'The Ropewalk.' The twisting of the fibres was accomplished by a man who walked backward down the «walk,» spinning from the hemp which was strung around his waist. The twist was imparted to the rope by a wheel, which was at first turned by a boy, although this purpose was afterward attained by the use of horse, or even water power.

It was not to Boston alone that the early industry of rope-making was confined, however. Nantucket, in the old days of her prosperity, had three large rope-walks, all of which long ago disappeared; there was one at Castine, Me., one at Portland, Me., and several in other parts of the country, including one on Broadway, New York. In 1810 there were 173 rope-walks in the United States.

The large business which is now conducted on the Pacific Coast was instituted by A. L. Tubbs of California, sometime in the fifties, who purchased the machinery of one of the old Boston plants and shipped it to California, where two or three large factories now stand as monuments to his enterprise.

Prior to about 1850, nearly all the spun yarns used in the making of cordage were imported by the American manufacturers. As such yarns were the product of Russian serf labor, they could be brought to this country and sold for less money than similar yarns could be produced in America, so it was not until the introduction of improved machinery reduced the cost of local manufacture that the importation of this raw material ceased.

The modern factory system began to take the place of the more crude and primitive methods of making rope soon after 1830, and from that time until 1850 the conflict between the two modes of manufacture was waged with considerable bitterness. By the new system it was possible to spin a rope several thousand feet long upon an upright apparatus that occupied but a few feet square, the necessary twist being imparted by a rapidly rotating machinery which was not unlike that which is used in cotton and woolen mills. At the same time, while its cost was cheaper, the factory-made product was not an entire success. There were purposes for which the rope made by the rope-walk method was far superior, and the makers of the old-fashioned article used the words «patent cordage» to disparage the factory-made product. As time passed, however, the invention of improved machinery tended to put an end to such rivalry. The most important inventions are those of John Good, of New York. It was his spreaders and breakers that did away with the use of lappers, and his nipper and regulator on spinning-machines that gave such universal satisfaction until the perfection of the «preparation machinery» evolved methods that superseded his process.

The rope-forming machine has a gage-plate through which the threads pass, a capstan on which the first cord is twisted, a right-and-left-hand screw to guide the cord back and forth on the winding-reel, and the necessary driving mechanism. It delivers accurately twisted strands or cords which go to the laying machine. This draws in the cords, with a tension-regulating device, twists them by means of a capstan, and winds them on a large reel. Ropes are commonly marketed in coils of 1,200 feet length. A 10,000 foot rope has been made without a single splice.

Cotton is used for making string, and some cord and rope. It makes a neat white string that can be readily dyed. It is a useful material for bands, as in cotton spinning, but cotton rope costs more and is less durable than hemp. The great bulk of the manufacture in the cordage industry is of either imported Manila fibre or sisal (Mexican hemp). The Manila hemp is from the herb *Musa textilis* of the banana family. Sisal is from the *Agava Ixtli*, of Yucatan and Mexico. The best hemp fibres are 6 to 12 feet long, and test ropes of 1¼ inches diameter have been made to withstand a tensile strain of 50,000 pounds. The twisting has to be done scientifically not to weaken the fibre. In modern practice the strands are often flattened so that they will lie closely in the rope or cable.

It was the invention of the self-binding harvester that played an important part in furthering the interests of the industry, and, about 1878, the mills of the country began to increase their size and output to a noticeable degree. Among the most prominent factories started prior to or during that period, one may mention the establishments of Sewall, Day & Company, of Boston; the Pearson Cordage Company, of Boston; J. Nickerson & Company, of Boston; Weaver, Fitler & Company, of Philadelphia, afterward, as at the present time, Edwin H. Filter & Company; the Plymouth Cordage Company, of Plymouth, Mass.; the Hingham Cordage Company, of Hingham, Mass.; the New Bedford Cordage Company, of New Bedford, Mass.; Baumgardner, Woodward & Company, of Philadelphia; J. T. Donnell & Company, of Bath, Me.; William Wall & Sons, of New York; Lawrence Waterbury & Company, of New York; Tucker, Carter & Company, of New York; the Elizabethport Steam Cordage Company, of New York; Thomas Jackson & Sons, of Easton, Pa.; J. Rinek's Sons, of Easton, Pa.; and John Bonte's Sons, of Cincinnati.

As may be seen from the above list, the cordage industry, even in those comparatively recent times, was largely confined to towns either on the coast or in close proximity to the seaports, for those were the days when the great demand for cordage was for export purposes, or for the direct use of ships temporarily located at the American ports. Later, such factors as the decline in American shipping; the substitution of wire for hemp standing rigging, and the increased demand for binder twine, so altered the conditions of the industry that the location of factories became a matter of secondary importance. Thus, they began to multiply in the interior, especially in the Middle West, such cities as Akron, Peoria, Xenia and Miamisburg, becoming a new centre for the industry.

In 1843 the total quantity of manila hemp that was manufactured in the United States amounted to only 27,820 bales, or 7,511,400 pounds. To realize the ridiculously small proportions of such a product, it is only necessary to remember that any one of several of the large mills in this country could now manufacture the same quantity of hemp in less than 50 days, by running day and night, or that a similar quantity of hemp could now be brought direct from Manila in about the same length of time by the use of two steamers. So rapidly did the industry expand, however, that, by 1863 it had increased in size to no less than five times, while the period of the Civil War created such a demand for cordage that the factories in the North were utterly unable to comply with it. The profits of one Eastern factory alone, during that period, amounted to more than $500,000 a year, and this was no exceptional case, for everywhere manufacturers were fairly inundated with orders that they simply could not fill. It was about 1860 that the first sisal hemp was imported into the United States. Purely an experiment in the beginning, less than 200 tons having been used during the first year, the product was so favorably received by the trade that it soon became one of the great factors in the cordage industry, a fact which fully accounts for the rapid increase in importations from the paltry 200 tons to the amount of our present imports, a quantity that is greatly in excess of 80,000 tons.

During these years no action had ever been taken to regulate the price of cordage. Business had extended until the American product was accounted a factor in almost every part of the world. To meet these ever-widening demands, factories had increased, both in number and in the importance of their output, but no effort had been made to fix the price of the product. As the result certain abuses had come to prevail among the firms engaged in the business, and it was to meet this situation and better, if possible, the condition of affairs, that the first meeting of the cordage manufacturers was held early in 1861. The result of this meeting was an agreement, which was perfected and signed, on 23 February. Thereafter weekly meetings were held by the manufacturers, at which trade conditions were not only discussed, but any complaints were considered, and regulations were effected respecting the standard of prices. From time to time the agreement of 1861 was amended, and in July 1874 a complete revision was adopted, the manufacturers pledging themselves, «as men of honor and integrity,» faithfully to observe all its provisions. In April 1875 a still stronger agreement was made, but as complaints about underselling were still made, and as, in the absence of any specified penalty, it was necessary to accept any reasonable excuses, the manufacturers finally decided to adopt what has since been known as the «pool system.» According to this system, which went into operation 1 Jan. 1878, the business of the country was divided among the various manufacturers in what was deemed just proportions. When the business of either of these concerns in any one month exceeded the proportion which had been assigned to it, it was compelled to pay a certain amount per pound on the excess to the treasurer of the «pool,» while the concern that fell behind the specified production received a gratuity to a corresponding extent. The novelty of the plan acted in its favor for a time, and, although it did not entirely put a stop to the custom of cutting prices, it worked so well that the scheme was continued from year to year. The percentages ranged from 11¼ to 1 per cent.

In January 1880 the amount of the pool was reduced, by stages, from 2 to ¼ of a cent per pound, and in January 1881 it was abolished altogether. By 1882 conditions had become so unsatisfactory that it was found necessary to re-establish it and, on 28 June, new proportions were agreed upon. These remained in force for a period of three years, when the new concerns that had been formed were taken into the "pool," and after much labor, a new adjustment of proportions was accepted in July 1885, remaining in existence until April 1887, when it was broken up.

The history of the National Cordage Company, the next attempt to associate the various cordage manufacturers, dates from 1 Aug. 1887, when four of the leading New York concerns formed themselves into a "trust." Their aim was to control the price of manila and sisal hemp, but the effort was a failure. In January 1890, an attempt was made to compel other manufacturers to join their organization. As none of those who complied with these demands knew the terms which had been made with his neighbor, a condition of distrust was engendered which finally, 4 May 1893, drove the corporation into the hands of a receiver, in spite of the fact that it had paid 8 per cent dividends on its preferred stock since 1891, and from 9 to 10½ per cent on its common, the last dividend being declared on both only three days before the failure.

As the result of the reorganization the United States Cordage Company was formed, but as this corporation was also unsuccessful in its schemes to monopolize the purchase of raw material, the factories which had been purchased by the National Cordage Company went back into the market. Some of them were repurchased by their former owners or their representatives; others went into new hands.

An unusual factor in the cordage trade was represented by the binder twine situation. In the beginning, when there was considerable doubt as to the success of the twine, the cordage houses made it for the manufacture of harvesting machinery at a profit of several cents a pound. When the market position of this produce was established, the harvest-machine makers began to manufacture their own twine, and while this was done at a third of its original cost, the loss of these contracts was a serious setback to the cordage industry. According to the United States census of manufactures for 1914, the total number of establishments engaged in the manufacture of cordage and twines was 103. Their output for that year amounted to 487,443,356 pounds of rope and binder twine, valued at $43,085,517; cotton rope, 13,244,198 pounds, valued at $2,539,906; and other twine, 105,249,677 pounds, valued at $13,996,522 — a total value of $59,621,945.

The output of twine, other than binder twine, was valued at $13,996,522, an increase of 56.7 per cent since 1909. This value comprises that of twine made from cotton, jute, hemp, flax and other materials. The output of cotton twine in 1914 was 17,927,286 pounds, valued at $3,472,056, representing a decrease of 12.2 per cent in quantity and 1.3 per cent in value as compared with the 1909 figures. Of jute twine the 1914 production — 55,282,159 pounds, valued at $5,268,357 — showed an increase during the five-year period amounting to 55.7 per cent in quantity and 106 per cent in value. Hemp twine showed an increase of 16.3 per cent in quantity and 45.1 per cent in value, and flax twine an increase of 33.3 per cent in quantity and 26.6 per cent in value. The output of other twines, including those made from mixed materials, increased 110.7 per cent in quantity and 179.9 per cent in value.

Of the total value of products in 1914, $83,228,424, that of rope and binder twine represented 54.8 per cent. Exclusive of cotton rope the output of these products increased from 411,443,281 pounds valued at $30,918,693, in 1909, to 487,443,356 pounds, valued at $43,085,517, in 1914, or by 18.5 per cent in quantity and 39.4 per cent in value.

The production of cotton rope and twine, above given, does not represent the entire output of these commodities, a considerable quantity having been made by establishments classified in the cotton manufacturing industries. The combined production of ropes and twines from cotton and cotton yarns amounted in 1914 to 49,972,017 pounds, valued at $9,695,310, representing a decrease of 14.6 per cent in quantity and 4.1 per cent in value as compared with the 1909 output. The aggregate production of ropes and twines of all kinds, in all industries, however, increased during the five-year period from 525,340,375 pounds, valued at $46,446,575, to 624,737,764 pounds, valued at $63,305,293, or by 18.9 per cent in quantity and 36.3 per cent in value. The materials represented by the 1914 total comprised Manila hemp, New Zealand hemp, Hennequin (sisal from Mexico and Cuba), sisal (from Africa, the Bahamas, Hawaii and Java) and all other hard fibres taken as a group. The soft fibres comprised jute, jute butts, flax and flax tow, hemp and hemp tow and others.

CORDAITALES (from the genus *Cordaites*, named in honor of A. J. Corda), an extinct great group of naked seeded and primitive gymnospermous plants, resembling in certain respects the cycads and cycadeoids, ginkgo, especially the yews among conifers, and the araucarias. The Cordaitaleans are the most ancient of well-known seed-plants. They must have evolved in the Silurian or earlier; in the Devonian they formed the world's first great forests; throughout the Carboniferous they remained cosmopolitan elements of climax forests; while in the Permian they declined, and the record closes in the Lias. In North America large and finely silicified trunks occur in Canada, Ohio, Indiana, Oklahoma and elsewhere. Some of the sections of petrified trunks from the Black Shale (upper Devonian) of Indiana are two or more feet in diameter by 20 feet long, and indicate stately forest trees from 100 to 150 feet high. In portions of the *Cordaites* shale of New Brunswick the leaves often occur packed in layers like those of modern forests. The group appears to have culminated in the upper Carboniferous coal-swamp forests. There the stems and leaves with a great variety of staminate fruits and seeds are especially abundant. The most noteworthy Cordaitalean specimens are the silicified leaves, stems and fruits with microscopic structure preserved from the "black flints" of the Coal Measures of Grande Croix, France. Study of this material, together with various trunks, casts and imprints, has revealed nearly all the critically important structures of these long-extinct plants.

The Cordaitales were mostly tall and rather slender trees with columnar trunks which only branched freely near their summits. The leaves were usually large and spirally inserted. In foliage and habitus various forms were much like *Dammara*, the New Zealand Kauri pine

(Fig. 1); but some of the types must have greatly resembled *Araucaria imbricata* (q.v.). The larger species even as far back as the Devonian vied in size with both of these modern climax forest makers. Some of the strap-leafed types must have had the appearance of the screw pine. Large leafed forms like that of figure 2 branched less freely or were simply columnar. The leaves are of linear to broadly elliptical form, and vary rather more than in the modern conifers. Smaller species are no more than 10 centimeters long; but a leaf length of two metres with a width of 20 centimeters is sometimes reached.

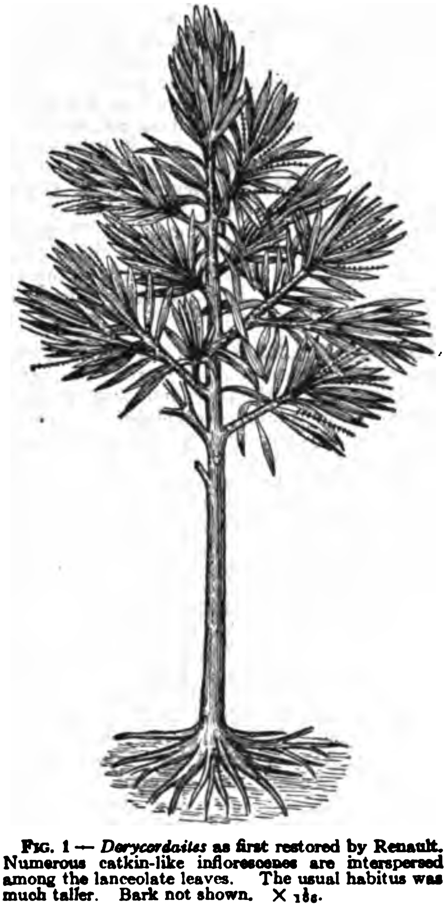

FIG. 1 — *Dorycordaites* as first restored by Renault. Numerous catkin-like inflorescences are interspersed among the lanceolate leaves. The usual habitus was much taller. Bark not shown. × $\frac{1}{36}$.

On the basis of the leaf forms Grand 'Eury divided the group into the genera *Cordaites, Dory-* and *Poa-Cordaites.* The first of these divisions (cf. Fig. 3) includes mainly very large spatulate and blunt-end leaves, the second large lanceolate and sharply pointed leaf types, and the third grass-like forms. The genus *Cordaites,* as first used, may include any of these. Isolated stems have usually been described as *Cordaioxylon,* or often as *Araucarioxylon,* because of the structural similarity to the wood of modern Araucarias. Branches can be called *Cordaicladus,* and the large isolated pith casts, looking like piles of coins, were long only known as *Artisia* or *Sternbergia.* Staminate fruits are named *Cordaianthus,* and the seeds *Cordaicarpus.* On the basis of wood structure classification is likewise provisional, since studies of entire stems are seldom or never possible to carry out. Three more or less overlapping divisions are also distinguished by Scott. (1) The Poroxyleæ were far the most fern-like. The stems were slender, only a few centimeters in diameter. They had long internodes and a double leaf trace bundle as in *Lyginopteris,* from which they mainly differ in their lack of centrifugal primary xylem. The petioles are known, and the bi-lateral seeds called *Rhabdocarpus* appear to belong here. (2) The Pityeæ include *Pitys* (with three species from the lower Carboniferous of southern Scotland), *Archæopitys* of the Waverly shale of Kentucky, and *Callixylon.* A very fine stem of the latter from the Indiana Devonian is called *Callixylon Oweni,* and a related species is Russian. This group is only known from the pith and wood. The trees reached large size, but still retained mesarch strands of primary xylem traversing the medulla next the secondary wood. They are thus of great interest as forms intermediate

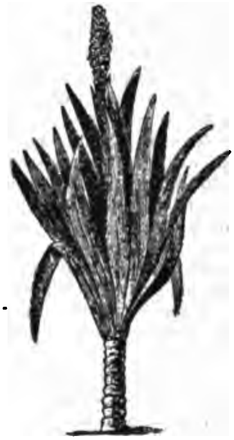

FIG. 2 — Large leaf simple-stemmed Cordaitalean with prolonged fertile axis. × $\frac{1}{16}$. From Dawson.

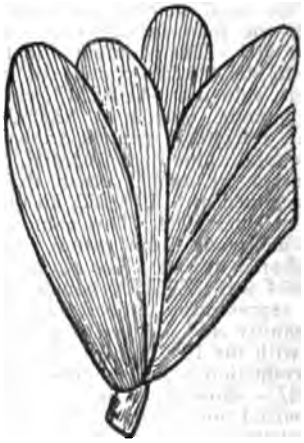

FIG. 3 — *Cordaites lingulatus.* Group of attached leaves. After Grand 'Eury. (Reduced.)

between the fern-like Poroxyleæ and typical Cordaiteans. (3) The Cordaiteæ are the most advanced type and the greatest forest makers. Some species reached 150 feet in height and three feet in diameter. The stems still more closely resemble *Araucaria* in structure, the elements of the wood all being radially arranged. No distinction between primary and secondary wood appears in the transverse section. The strands of "old cryptogamic wood," characteristic of the preceding divisions, are lost. In the radial section narrow spiral elements of the protoxylem next the broad discoid pith are succeeded by wider spiral tracheides, many rows of scalariform elements, and lastly the pitted tracheides forming the bulk of the wood. The pits of this wood are generally in two or more densely crowded rows. Their alternation tends to produce hexagonal outlines, though isolated pits retain their circular form. The pore is usually an oblique slit, and the crossed slits of appressed facing pits are highly characteristic. The medullary rays are thin, mostly one cell thick. The secondary wood is thus quite indistinguishable from that of *Araucaria*. The phloem is radial, the cortex parenchymatous and provided with secretory sacs. The outgoing leaf traces are double, as in *Araucaria*, *Ginkgo* and various primitive gymnospermous forms. There was a thick bark, recalling that of *Araucaria*. As in that modern type there are diarch roots with spiral protoxylem and the scalariform tracheides, followed by the secondary pitted wood. Triarch and tetrarch roots of similar structure are known. The very large cycad-like pith of all these stems appears to owe its discoid structure to tension during growth; but this feature may be seen in various modern plants such as the hickory and the walnut. Growth rings of the discontinuous or Araucarian type may occur. Amongst forms structurally antecedent to the three foregoing groups, and more fern and cycad-like may be mentioned the stems classed as the *Calamopityeæ* with petioles known as *Kalymma*. Well-conserved forms of these occur in the Waverly of Kentucky at the close of Devonian time. The leaves of the Cordaitaleans are conspicuously parallel veined with repeated dichotomy in all but the narrowest grass-like forms. Anatomically they are very similar to the single pinnules of either the cycads or the cycadeoids. As in the latter the structure is well known from silicified specimens. The bundles are usually described as of the mesarch type, but the centrifugal xylem may fail. Each is surrounded by a strong sheath, usually connected with heavily developed hypodermal sclerenchyma. Intervening strands of the latter tissue may give to the leaf secondary venation.

Fructification.— The knowledge of the floral morphology of the Cordaitales now constitutes one of the most interesting chapters of paleobotany. It largely rests on the labors of Grand 'Eury and Renault, the latter having been so fortunate as to find silicified strobili of both sexes of certain species preserved in astonishing detail in the siliceous fragments or nodules of Grande Croix. Both male and female flowers, as well as seeds, have often been found directly attached to the leafy stems or branches (Figs. 4, 5, 7). The numerous flowers are borne in more or less catkin-like male and female inflorescences. Such recall those of Gnetaleans or even angiosperms. The floral order is usually spiral but may be distichous. No amphisporangiate flowers are known, although one form, *Cordianthus Penjoni*, suggests that such may have occurred. The usual condition indicates either monœcism or diœcism. The staminate flower is about a centimeter long and consists of a thick axis covered by spirally arranged bracts with interspersed fertile filaments bearing erect tufts of sporangia (Fig. 5).

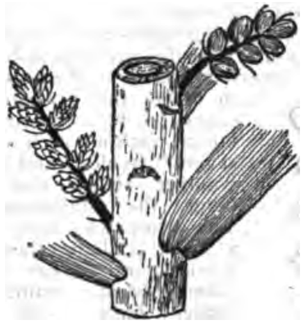

FIG. 4 —*Cordaianthus Pitcairniæ*. Branch of monœcious form bearing leaves and leaf scars with an ovuliferous inflorescence on the right, and on the left an inflorescence consisting of small staminate strobili. After Grand 'Eury.

Or, as Renault says, "In the midst of the sterile bracts arose one or more fertile bracts, the filaments of which scarcely modified bore at their summits three or four sacs containing the pollen." There is, therefore, a noteworthy analogy to the ovulate cones of the Cycadeoids. In these the stems bearing single erect seeds are likewise interpolated amongst sterile organs or scales.

The pollen grains which have been found both in place and actually in the pollen chambers of the macrospores are large and contain a highly interesting group of prothallial cells. This group is theoretically a transition stage between Pteridophytes and Spermatophytes. An extraordinary instance is recorded. In a seed of *Cordianthus Grand 'euryi* the outer integument is partly broken away, the nucellus being left standing free. In its upper end the pollen chamber contains the pollen grains as in *Ginkgo* and the cycads. An actual stage in pollination is thus seen. It is of fundamental importance

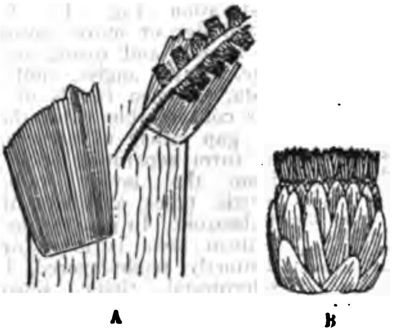

FIG. 5 — *Cordaites angulostriatus* from the French Stephanien. A, branch with male inflorescence, slightly reduced; B, single bud with protruding anthers, enlarged from Grand 'Eury.

that the pollen grains found in the nucellar canal are larger than those in the sporangia, and their group of internal cells more developed; while grains found free in the matrix exhibit an intermediate condition. Evidently the pollen grains continued to grow after their discharge from the anther, and especially after entrance into the pollen chamber. Such a condition is one of the most readily thinkable later stages in the evolution of heterospory and seeds from asexual spore-producing diœecious free prothalli. The presence of free swimming spermatozoids is surmised.

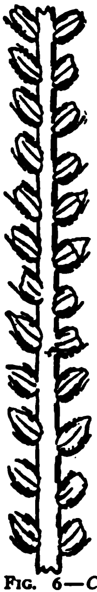

FIG. 6—*Cordaianthus spicatus* Lesquereux. Diagrammatic, showing involucrate nutlets distichously to subalternately borne on both sides of a thick rigid stem. Involucral scales embracing the nutlets indistinct. From the coal measures of Pittston, Penna. One half natural size.

The seed-bearing spikes are of varied form; in some, solitary ovules accompanied by a few bracts are inserted directly on the axis (Fig. 6); in others this arrangement appears to be compounded, the lateral catkins each containing several ovules and in their younger stages much resembling the staminate forms. The ovule was thus borne on a short axillary shoot as in *Taxus* or *Ginkgo*. In such forms basal stamens may earlier have been present, forming a *Tumboa*-like fruit (Fig. 5). While homology with other gymnosperms is not very close, it is evident that this open type of inflorescence was capable of undergoing change in the direction of modern forms of compaction and reduction. Undoubted Cordaitean seeds (those found attached) are mostly cordate, and flat or platyspermic. The winged seeds about a centimetre long called *Samaropsis* (Fig. 7), were attributed by Grand 'Eury to the genus *Dorycordaites*, seen in the restoration Fig. 1. Others reach five or more centimetres in length, and owing to their size, heavy angles, and thick testa, are also fossils of striking conservation. But there is no gap either of structure or of form separating such seeds from the larger radiosymmetric types abundant in the Palæozoic. In general the Cordaitean testa is more or less distinctly triple-layered, if the sclerotestal tissue separating the outer fleshy sarcotesta from the inner flesh be called a layer. The chalazal bundle may give off branches into both the inner border of the sarcotesta and the nuceleus. In a form called *Cycadinocarpus angustodunensis* the archegonia are plainly present, but embryonic structures have never been observed in such seeds. They are scarcely separable from those of the quasi-ferns and greatly resemble the seeds of modern cycads. The seeds of the cycadeoids, owing to reduction, present a far less visible similarity.

The Cordaitales derive a unique significance from their age and primitive characters, so manifestly important in our conception of the manner and course of plant evolution. Botanists have been inclined to believe that the Cordaitalean and Cycadalean groups had a common filicalean ancestry, and that from the Cordaitales have been derived the Ginkgoales, the Coniferales and probably the Gnetales. Some would go further and place the Cordaitales in a position ancestral to angiosperms as well. Opinion is about equally divided between a Cordaitalean and an Equisetalean derivation of *Araucaria*. Recent investigation calls these theories of descent more in question. It is now recognized that fossil types are seldom the true antecedents of later forms. Most fossil plants represent terminal climax constituents in the floras of the past; while the extent of homoplasy and parallelism yet remains to be measured. Certainly increasing knowledge of the Cordaiteans will show them to be more varied than as yet conceived, and in any case their discovery must be regarded as one of the great triumphs of palæobotany.

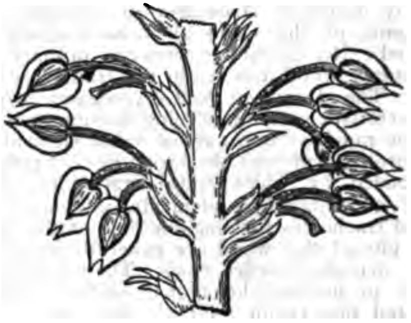

FIG. 7—*Samaropsis Pitcairnia*. Fragment of an ovulate inflorescence from Westphalia with the seeds in groups and borne on elongated stems. Natural size. After Carruthers.

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G. R. WIELAND,
Lecturer in Paleobotany, Yale University.

CORDAY D'ARMANS, kôr-dā̆ dār-mā̆ṅ, **Marie Anne Charlotte**, French revolutionist: b. Saint Saturnin, near Séez, Normandy, 27 July 1768; d. Paris, 17 July 1793. She had passed her early years in a convent and had read Plutarch, Rousseau, Raynal and Voltaire. Her lover was accused by Marat as a conspirator against the republic, and assassinated by villains hired for that purpose. This excited

Charlotte Corday to revenge. History had inspired her with a deep-rooted hatred against all oppressors, and she determined to free her country from Marat. Having left home, she entered Paris 11 July 1793, and obtained an interview with Marat on the pretext of disclosing Girondists' plots. In the *Ami du Peuple* of that morning Marat had asked for 200,000 heads, and Charlotte told him she could give him those of the Girondists at Caen. The assemblies at Calvados were the first subjects of conversation, and Marat heard with eagerness the names of those who were present at them. «All these,» he exclaimed, «shall be guillotined.» At these words Charlotte plunged her dagger into his bosom, and he called out «*A moi! mon ami*»; when some attendants rushed in and seized her. On the morning of 17 July she appeared before the revolutionary tribunal with a dignified air, and her replies were firm and noble. She spoke of her deed as a duty which she owed her country. Being condemned to death she was guillotined the same day, retaining her presence of mind to the last. Her remarkable beauty, and her lofty bearing on her way to the guillotine, sent a thrill even through the hearts of her executioners. One young German enthusiast, Adam Lux, a deputy from the city of Mentz, on witnessing the execution, conceived a romantic passion for her, and when her head fell, he cried with a voice hoarse with emotion: «She is greater than Brutus.» He wrote a pamphlet, suggesting that a statue with such an inscription should be erected to her memory. He was arrested and guillotined. André Chénier, who had paid a glowing poetical homage to her heroism, shared the same fate before a year had elapsed. When Vergniaud was informed of Charlotte's death, he exclaimed: «She has killed us, but she teaches us how to die.» Consult Dubois, ‹Charlotte Corday› (Paris 1838); Defrance, ‹Charlotte Corday et la mort de Marat› (1909); Lamartine, ‹Histoire des Girondins›; Huard, ‹Mémoires sur Charlotte Corday› (1866); Vatel, ‹Charlotte Corday et les Girondins› (Paris 1872); ‹Bibliographie des femmes célèbres› (3 vols., Turin and Rome 1892–1905).

CORDELIA, the youngest daughter of Lear in Shakespeare's tragedy, ‹King Lear.›

CORDELIERS, kor-dā-lē-ā. 1. Another name for the Franciscan friars in general, but given, in France, to the branch of the order usually known as Franciscan Friars Minor (O. F. M.). After the death of Saint Francis in 1226, the next minister-general of the order relaxed somewhat the rigor of the rule of poverty as taught and practised by Saint Francis. This relaxation caused a division in the order, a number of the friars adopting the modified rule were called Conventuals (O. M. C.), and those adhering to the original observances were called Observantines, and later, Friars Minor. In France the name Cordeliers was given to them on account of their girdle. The Cordeliers or Friars Minor are in several places in the United States. (See Franciscans). 2. A political club during the first French revolution, which received the name of Cordeliers from the fact that its members met in the chapel of the old convent of the Franciscan friars situated near the Rue de l'École de Médicine and the Rue de l'Observance, in the centre of the quarter of Paris known as the Cordeliers' district. The club of the Cordeliers became the focus of the wildest agitators, while at the same time it was constantly quarreling with the Jacobin Club. The leading events of the reign of terror may be traced to the conflict of the two clubs, and chiefly to the influence of the Cordeliers, of whom Marat and Danton were the ruling spirits. Anacharsis Clootz was also one of the members. At the time the club was in its zenith, Camille Desmoulins edited a popular journal in connection with it, under the name of *Le vieux Cordelier,* without, however, identifying himself completely with the politics of the formidable club. They were the first to demand a republic, insisting on «Liberty, Equality and Fraternity.» After the execution of Danton, Hébert and Chaumette, the club declined in influence, and was closed by the law of 6 Fructidor, or 23 Aug. 1795, which dissolved all the political clubs of France. Consult Bougeart, ‹Projet d'organisation des Cordeliers› (Paris 1870); also ‹Les Cordeliers, documents pour servir à l'histoire de la Révolution› (Caen 1891).

CORDIER, kôr-dyā, **Henri,** American educator: b. New Orleans, La., 8 Aug. 1849. He was educated in Paris; has been successively secretary of the Chinese Educational Mission, professor at the School of Political Sciences, Paris, and at the School of Oriental Languages, Paris. He is a member of the Council of the Asiatic Society and honorary member of the Royal Asiatic Society, is president of the Société de Bibliographie, member of the Institut de France and Chinese mandarin. He has published ‹Catalogue of the Library of the North China Branch of the Royal Asiatic Society› (1872); ‹Narrative of Recent Events in Tong-king› (1875); ‹Bibliotheca Sinica: Dictionnaire bibliographique des ouvrages relatifs à l'Empire Chinois› (2 vols., 1881–85; Suppl., 2 vols., 1895; 2d ed., 4 vols., 1904–08); ‹Les voyages en Asie au XIV^{e} siècle du bienheureux frère Odoric de Pordenone› (1891); ‹Histoire des relations de la Chine avec les Puissances Occidentales› (3 vols., 1902); ‹L'Expedition de Chine de 1857–58› (1905); ‹L'Expedition de Chine de 1860› (1906); ‹La Chine en France au XVIII^{e} siècle› (1910); ‹Bibliotheca Indo-Sinica› (1913–). He edited the third edition of Yule, ‹The Book of Ser Marco Polo› (2 vols., 1903), and the same author's ‹Cathay and the Way Thither› (1913). Since 1890 he has edited *Tsung Pao,* a review of Oriental affairs.

CORDIERITE, a name formerly given to the mineral iolite (q.v.), in honor of Cordier, a French geologist.

CORDILLERAS, a name from the Spanish for a mountain chain or ridge, formerly applied to any lofty and straight areas of land, but now specifically to chains, ranges or ridges of mountains, and especially to such of these elevations as are long and continuous. It is used particularly in physical geography, although in geology also it is sometimes applied to mountain systems at or near the coasts or borders of continents. The name was first given by the Spaniards to the chains of the Andes in South America, and was afterward extended to their northern continuation through Central America and Mexico, and finally to the entire mountain systems stretching up the western coast of the United States, British Columbia and Alaska, and spreading eastward to include the Rocky Mountains (q.v.). This portion of the continent geographers have come to call the Cordilleran region of North America, designating the corresponding elevations of South America under the old name of Andes. This region covers in the United States the whole western mountain portion of the country, including the Sierra Nevada, the Coast Range, the Cascade Range, and extending to and embracing the Rocky Mountains, as well as all the ranges lying between them and the mountains of the western coast. Included within this Cordilleran region are mountain systems many of whose lesser chains, in length and elevation, equal some of the famous ranges of Europe.

CORDITE, a smokeless powder employed by the English government. It was invented in 1889 by Sir Frederick Abel and Prof. James Dewar, and originally consisted of a mixture of nitro-glycerine 58 parts, nitrocellulose 37, vaseline 5, but on account of the erosion of the bore caused by the high percentage of nitro-glycerine and the danger of exudation of the nitro-glycerine and consequent detonation, the present proportions are more nearly 15 parts of nitro-glycerine, 80 of nitrocellulose and 5 of vaseline. This demanded an increase in the capacity of the gun chambers. This was done gradually, so that guns of earlier design could be used till they wore out.

The nitrocellulose is a mixture of various cellulose nitrates, insoluble and soluble. At the Royal Gunpowder Works at Waltham Abbey it is required that the nitrocellulose used shall not contain more than 12 per cent of soluble cellulose nitrate, or 0.6 per cent of mineral impurities, nor less than 12.5 per cent of nitrogen. It is made by intimately mixing the ingredients in a mechanical kneading-machine with the aid of acetone, by which the whole is converted into a gelatinous mass which is then squirted into cords by means of a «stuff press,» a machine similar to those used in forming macaroni. The cords vary in diameter from 0.01 inch to 0.65 inch. The former are chopped into short lengths for use in pistols, the latter for use in 12-inch guns. The cords for small-arm cartridges are 0.0375 inch in diameter. The cords are heated in drying houses to drive off the acetone, leaving them in the form of an amber-colored, translucent, flexible mass.

Cordite is made up into charges by reeling the cords on bobbins, and then spinning these strands into larger cords, thus obtaining the desired length, volume and weight. See Explosives; Nitrocellulose; Smokeless Powders.

CÓRDOBA, kōr'dō-vä, **Fernando Fernandez de,** Spanish general and statesman: b. Madrid 1792; d. 1883. He entered the military service in 1810, and was rapidly promoted during the war with Napoleon. In 1847 he officiated for a short time as Minister of War, and was appointed inspecting general of the infantry. On 8 March 1850 he was made captain-general of New Castile; in the following year to the same position in Cuba, and in 1853 general-in-chief of the cavalry. Immediately after the outbreak of the revolution of 1854, he was called upon by the queen to form a new cabinet. This he declined, but he ordered his soldiers to fire upon the insurgents, and when the latter proved victorious, he fled to France. In 1856 he returned to Spain, and was reinstated in his position of general, and 10 years later was active in the revolution which drove Queen Isabella from the throne. He was captain-general of Cuba for the second time in 1870.

CÓRDOBA, Francisco Hernandez de, Spanish soldier and explorer. See Hernández de Córdoba, Francisco.

CÓRDOBA, José Maria, South American general: b. Antioquía, Colombia, about 1797; d. 17 Oct. 1829. At the age of 15 he left his father, who belonged to the Spanish party, and joined a band of guerrillas, among whom he soon became noted for his intrepidity in their contests with the Spaniards. At the battle of Boyaca, 8 Aug. 1819, he won the rank of colonel. Not long after he was appointed general, and distinguished himself at the battle of Ayacucho, after which he was made general of division on the field. In September 1828 he became head of the War Department of the republic of Colombia, under Bolívar, but, a year afterward, revolted against him. He found but few adherents, however, and being attacked, 17 October, by a force greatly superior to his own, was slain with the most of his followers.

CÓRDOBA, Luis Fernandez de, Spanish general: b. Cadiz 1799; d. Lisbon, 29 April 1840. He took a prominent part in the movement of 1820 as a constitutionalist, and in that of 7 July 1822 as an absolutist. He officiated afterward on diplomatic missions abroad, and eventually deserting the forlorn cause of Don Carlos, espoused that of Christina and Isabel, took a distinguished part in the battle of Mendigorria, was appointed commander-in-chief of the Christinos as successor of Valdez, but unable to finish the war, was driven from office after the movement of 1836, and fled to France, whence he soon returned to Spain. He now conspired with the party of Narvaez against Espartero, but retired to Portugal when the latter came into power.

CÓRDOBA, Pedro de, Spanish Dominican missionary: b. 1483; d. Santo Domingo, 28 June 1525. He was vicar of the first Dominican colony in Hispaniola in 1510, preached against Indian slavery and endeavored to have laws framed for the protection of the Indians. His efforts in behalf of the Indians were successful to the extent that he drew the attention of the Spanish court to the evils going on in the government of the Spanish colonies in the New World; but the influence of the adventurers who swarmed into the country shortly after the discovery of America and the cupidity of the representatives of the Crown and of the land holders finally brought his work to naught; and the Indians in Hispaniola and neighboring islands soon became practically extinct.

CÓRDOBA, or **CORDOVA,** Argentine Republic, a province next in size to that of Buenos Aires, bounded on the north by Santiago del Estero, on the east by Santa Fé, on the south by Buenos Aires and the territorial government of Pampa Central, and on the west by the provinces of San Luis, La Rioja and Catamarca. Area 54,000 square miles. Its northwestern portion is mountainous, and rich in minerals. Copper, silver, gold, lime, marble, graphite and salt are found. The central and eastern regions lie in a great plain watered by the rivers Cuarto, Segundo, Primero, Dulce, etc., with the lake called Mar Chiquita; and here agricultural and grazing industries are carried on. Cattle, horses and mules are bred in the south; wheat and fruits are raised along the river courses; there are large flocks of sheep and goats in the centre and north. Besides wheat and fruits, the principal crops are maize, lucern, barley, sweet potatoes and white potatoes. Of the total productions, about one-half, in value, are pastoral, one-third agricultural. The mining industry is as yet comparatively undeveloped. Manufactures are flour, lime and cement, bricks, hides and leather, beer, wine and alcohol, boots and shoes, cut wood, vermicelli, gold embroideries, butter and cheese, cut stone, belts, candles and soap, artificial ice, etc. Principal railway centres are the capital city, Córdoba (q.v.), Villa María and Villa Nueva. Under the constitution of the republic dated 25 Sept. 1860 the province has its own constitution, «framed upon the basis of a republican representative system of government, and in harmony with the principles, declarations, and guaranties of the national constitution»; said provincial constitution relating to «the administration of justice, the administration of the local government, and primary instruction. Upon these conditions the federal government guarantees to each province the practice and enjoyment of its own constitutions.» The provinces have their own local institutions and laws; «they elect their governors, legislators, and provincial functionaries of all classes, without the intervention of the federal government.» The province is represented in the national legislature by two senators, elected by the provincial legislature, and by deputies elected directly by the people. Each province is for this purpose considered as an electoral district, and the election is by a plurality of votes in the proportion of one deputy to each 20,000 inhabitants, or fraction of that number not less than 10,000. Population of the province approximately 625,000.

CÓRDOBA, Argentine Republic, the capital of the province of the same name, situated on the right bank of the Rio Primero, 432 miles from Buenos Aires, at the junction of five railways. It is one of the progressive inland cities, having adopted many of the modern improvements, such as electric light, running water, street railways, sewers and excellent pavements. Its university, founded in 1813; astronomical observatory, established 1871; National Academy of Science; National Meteorological Institute; national college, normal schools and elementary schools, have made it well known as an educational centre. Railway communication with Buenos Aires was established in 1869. The first national fair was held here in 1871. A score of newspapers and reviews are published in the city. In size it is the third city of the republic. There are fine public buildings and private residences, and attractive parks. It was founded in 1583, and its university is in point of age second only to that at Lima among the South American universities. Pop. 100,000.

CÓRDOBA, Mexico, a town on the Mexican Railway, 66 miles west of Vera Cruz, in a fruitful valley 3,045 feet above the sea. It has manufactories of woolen and cotton goods and is surrounded by rich coffee plantations. Pop. 9,000.

CÓRDOBA, Spain, a town and capital of the province of Córdoba, situated on the Guadalquivir, in Lower Andalusia. It is built on a gentle declivity of a chain of mountains, forms an oblong quadrangle and is surrounded with walls and lofty towers. A part of the town is of Roman, a part of Moorish origin; many of the buildings are in ruins, and a number of gardens occupy a great part of the inhabited space. The streets are narrow, crooked and dirty; the plaza mayor, the principal market-place, however, is distinguished for its size, its regularity and the beauty of the colonnade by which it is surrounded. The remains of the residence of the Moorish kings now form a part of the archbishop's palace. The cathedral is a splendid building, originally a mosque, erected in the 8th century by King Abd-er-Rahman I. The mosque of Córdoba is, in the words of Gautier, «a monument unique in the world, and novel even for travellers who have had the fortune to admire the wonders of Moorish architecture at Granada or Seville.» It is 370 feet in length, 425 in breadth and has a bell tower 300 feet high. It was at one time the second largest sacred building of Islam, and is the most magnificent Mohammedan temple in Europe. It is surrounded by a wall supported by strong buttresses. Other points of interest are the Campo Santo, the site of Christian martyrdoms, and the chapel of the Hospital del Cardinal, once part of a mosque. From the 9th to the 12th centuries Córdoba was a great centre of trade; the leather exclusively manufactured there (cordovan) was exported in all directions. At what period the Romans laid the foundation of the town (Colonia Patricia, afterward Corduba) is not known. In 572 it was conquered by the Goths. During the reign of the dynasty of the Ommiades it was the capital of Arabian Spain; and afterward it became the residence of the powerful caliphs of the West, the sacred city of the Moors and the centre of Mohammedân worship and of Arabian splendor and science. At that time the city is said to have been about 15 miles in circuit and to have possessed a population of 1,000,000. In 1236 it fell an easy prey to Ferdinand III of Castile. In 1808 it was pillaged by the French, who captured it again under Soult in 1810. Pop. 65,200. The province of Córdoba includes the fertile and beautiful valley of the Guadalquivir and the snow-capped mountains of Sierra Morena. The area of the province is 5,298 square miles and the population about 460,000.

CORDON, in a military sense, troops so disposed as to preserve an uninterrupted line of communication, to protect, for instance, a country from hostile invasion; also a similar line intended to protect a place from contagious diseases. In the latter sense it is called a *cordon sanitaire*. The word «cordon» also means, in fortification, the coping of the escarp or inner wall of the ditch. It is usually rounded in front and projects one foot over the masonry.

In horticulture, cordon is a term applied to a system of training fruit trees. The trees are dwarfed by training and pruning to one or two stems which extend horizontally or obliquely, and from which the fruit-bearing spurs are developed. The objects sought are economy of space and increased size and improved quality of fruit. The system is in little use in America, where land is cheap, but in Europe it is very popular. It is best adapted to such trees as pears and apples, which naturally bear their fruits upon spurs.

CORDON BLEU, kôr'dŏn' blė, a knight of the ancient French Order of the Holy Ghost, at one time the most aristocratic order in the kingdom, whose decoration was attached to a blue ribbon or baldric. The knights frequently met in club form, and were noted for their excellent dinners, whence the term came to be applied to a cook of superior skill.

CORDON GRAND, grŏṅ, a term applied to a member of any grade of the French Legion of Honor, because the cross of the order is always suspended from a broad ribbon.

CORDOVA, Francisco Hernandez de, Spanish navigator: b. in the latter part of the 15th century; d. Cuba 1517. He was the discoverer of Yucatan, which he visited in 1517, and had several encounters with the natives. He lost some of his men, and two were taken prisoners and carried up the country. Shortly after his return to Cuba he died; but the account he gave of his discoveries led to a new expedition under Juan de Grijalva, to whom was subsequently assigned the honor of the discovery.

CORDOVA Y FIGUEROA, Pedro de, Chilean historian: b. Concepcion 1692; d. there after 1770. He served in the Chilean army in Araucania and was alcalde of his native place about 1740. He wrote a 'Historia de Chile,' which includes an account of the settlement of the country up to 1717. In 1739, by order of President Velasco, he founded Los Angeles, the capital of Araucania. The manuscript of the work was preserved at Madrid. It has been published in the 'Colección de historiadores de Chile.'

CORDOVA, Ala., town in Walker County, 30 miles north of West Birmingham, on the Saint Louis, San Francisco and Southern railroads. The principal industries are the manufacture of cotton and coal-mining. The Cordova bank has resources of about $50,000; and there is a school accommodating 500. The government is in the hands of a mayor and alderman. Pop. 3,000.

CORDOVA. See Cordoba.

CORDOVAN, a fine leather which took its name from the Spanish city of Cordova, where it was manufactured in large quantities. It was also called cordwain. The modern application of the term is to a grain leather from the best and strongest portions of a horsehide and used for heavy boots, as for walking or hunting.

CORDUROY, a ribbed cotton fabric, woven with a pile which is cut so as to leave the surface ridged in the direction of the warp. See Fustian; Velvet.

CORDWOOD, wood, especially firewood, cut in lengths of 4 feet and piled in an oblong stack 8 feet long and 4 feet high. The cubical content of 128 feet is the standard for determining the prices of sale or of labor on the material.

CORDYCEPS, kôr'dĭ-sĕps, a genus of its fungi, some of which are found parasitic on other fungi, while others are remarkable for growing on the larvæ of insects, which they latterly kill. It grows very freely over a wide area, and in different countries 28 species have been found.

COREA, kō-rē'ą. See Korea.

COREAL, kō-rā-äl', **Francisco,** the name affixed to the 'Voyage aux Indes occidentales,' which was issued in Paris 1727. Its author asserted that he was born in Carthagena, Spain, in 1648 and had traveled extensively through Florida, Mexico and South America. The book abounds in errors and is probably a compilation. The work passed through several editions, one of the most important of these being published in Brussels in 1736.

COREGONUS, kō-rĕg'ȯ-nŭs, a genus of abdominal fishes, family *Salmonidæ*. The teeth are very small or wanting, the scales large and the height or front of the first dorsal as great or greater than its breadth. The genus is common in European waters and unusually large varieties are found in the rivers of Siberia. The best-known American representative is *Coregonus clupeiformis*, the whitefish. They inhabit clear lakes.

CORELLI, Marie, English novelist: b. Italy 1864. In infancy she was adopted by Charles Mackay, the poet. She was educated in London, and on beginning her literary career adopted as a pen name that which subsequently became her legal name. She has published 'A Romance of Two Worlds' (1886); 'Vendetta' (1886); 'Thelma' (1887); 'Ardath, the Story of a Dead Self' (1889); 'Wormwood'; 'The Soul of Lilith' (1892); 'Barabbas' (1893); 'The Silence of the Maharajah' (1895); 'The Sorrows of Satan' (1895); 'Cameos' (1896); 'The Mighty Atom' (1896); 'The Murder of Delicia' (1896); 'Ziska' (1897); 'Jane' (1897); 'The Master Christian' (1900); 'Boy' (1900); 'Temporal Power' (1902); 'God's Good Man' (1904); 'The Treasure of Heaven' (1906); 'Holy Orders' (1908); 'The Devil's Motor' (1910); 'The Life Everlasting' (1911); 'Innocent, Her Fancy and His Fact' (1914).

CORENTYN, kō-rĕn-tin', a river of South America, separating British and Dutch Guiana, and flowing into the Atlantic. It has a course of about 400 miles, and is navigable below the Great Cataracts in lat. 4° 20' N.

COREOPSIS, kō-rę-ŏp'sis, a genus of annual and perennial herbs of the family *Asteraceæ*. Nearly all the species are natives of eastern North America. They have showy, generally yellow, flowers in heads, and are widely cultivated in gardens. They are of easiest culture, being grown from seeds sown in a hot-bed and transplanted to any ordinary garden soil where they will blossom freely with little attention beyond keeping the ground free from weeds.

COREY, William Ellis, American capitalist: b. Braddock, Pa., 4 May 1866. He was educated at Duff's College, Pittsburgh. When 16 years old, he entered the chemical laboratory of the Edgar Thomson Steel Works, and five years later he went into the Homestead Steel Works, where, in 1889, he became superintendent of the plate mill, in 1893 superintendent of the armor-plate department, and in 1897 general manager. From 1901 to 1903 he was president of the Carnegie Steel Company and from the latter year to 1911 president of the United States Steel Corporation. He was one of the circle of men associated with Andrew Carnegie in the development of his great steel industries.

CORFE CASTLE, a castle in Dorsetshire, England, now in ruins, standing a little north of a small town, to which it gives its name, and with which it is connected by a bridge of four arches. It was built by King Edgar in the 10th century and at its gates his son Edward the Martyr was murdered in 979. It was the occasional residence of King John, and was for some time the prison of Edward II. During the great civil war it was heroically defended against the parliamentarian forces by Lady Bankes. It was subsequently taken by Fairfax through the treachery of an officer of the garrison, when it was demolished, 1646. Consult Bond, T., 'History and Description of Corfe Castle' (London and Bournemouth 1883).

CORFIELD, William Henry, English sanitarian: b. Shrewsbury, England, 14 Dec. 1843; d. Marstrand, Sweden, 26 Aug. 1903. He was educated at University College, London, and in the medical schools of Paris and Lyons, and was the first professor of hygiene appointed in University College, London. He published 'A Digest of Facts Relating to the Treatment and Utilization of Sewage' (1870); 'Lectures on Water Supply, Sewerage and Sewage Utilization' (1875); 'Laws of Health' (9th ed.); 'Dwelling Houses: Their Sanitary Construction and Arrangements' (4th ed., 1898); 'Disease and Defective House Sanitation' (1896).

CORFU, kôr-foo′ (anciently CORCYRA), Greece, island in the Mediterranean, the most northerly and the largest of the Ionian Islands, at the mouth of the Adriatic, near the coast of Albania, about 40 miles long, and from 15 to 20 wide; square miles, 431. The surface rises in the north at one point to the height of 3,000 feet, but the south portion is low. The scenery is beautiful, the climate pleasant and healthful, save for malaria in the centre and in the south, and the soil is fertile. Oranges, citrons, grapes, honey, wax, olives and oil are abundant. Salt is also produced in some quantity. The ancient name of the island was Drepane. A Corinthian colony settled in the island in the 8th century B.C., taking it from the Illyrian inhabitants. Corcyra's quarrel with Corinth was one of the immediate causes of the Peloponnesian War. The Venetians possessed Corfu from 1386 to 1797, making it a Christian bulwark against the Turks. The British held it from 1815 to 1864. Pop. 99,571. Corfu, the capital, is finely situated on the eastern coast on a promontory which terminates in a huge isolated rock crowned by the citadel; the streets are Italian in style. The chief edifices are the cathedral, government palace and Ionian Academy. There is a good harbor and considerable trade. It is the seat of a Greek archbishop and of a Catholic bishop. Consult Riemann, 'Corfou' (Paris 1879); Partsch, 'Die Insel Korfu' (Gotha 1887); Schmidt, 'Korkyräische Studien' (Leipzig 1890). Pop. 28,254.

CORIANDER, a plant, *Coriandrum sativum,* of the parsley family, native of southern Europe but sometimes established as a weed in North America. It is an annual with finely divided leaves and small white flowers. It is commonly cultivated for the "seeds" (fruits), which are used in flavoring pastries, confectionery and liquors.

CORIGLIANO CALABRO, kō-rē-lyä′nō ka-lä′brō, Italy, city in the province of Cosenza, four miles from the Gulf of Taranto and 70 miles southwest of Taranto. It has a castle and an aqueduct, and markets a high quality of manna from the ash trees of the surrounding country, as well as some oil. It was destroyed in 1806 by the French. Pop. 16,338.

CORINNA, Greek lyric poetess of Tanagra, in Bœotia. She was contemporary with Pindar, whom she is said to have conquered five times at musical contests, and therefore her image crowned with the chaplet of victory was placed in the gymnasium of Tanagra. According to Pausanias, who relates this fact, she was so beautiful that her charms may have influenced in some degree the opinion of the judges. Of the numerous poems which the ancients ascribed to her, only a few fragments have come down to us. Her poems were all in the Bœotian dialect. They have been collected by Bergk in 'Poetae Lyrici Graeci' (4th ed., 1878), and by Schneidewin in 'Delectus Poetarum Græcorum' (-839). Madame de Staël has given the name of Corinne to the heroine of one of her novels. In 1907 a papyrus was found of the 2d century A.D. on which were considerable remains of two poems attributed to Corinna. Consult 'The Year's Work in Classical Studies' (for 1907); Edmonds, 'New Fragments of Corinna' (1910).

CORINNE. 'Corinne' (1806) was the crowning point of Madame de Staël's literary career. In it her ideals find their most complete expression. By it, pre-eminently, and by her 'Germany,' in the words of Faguet, "she sowed the century with fertile ideas and gave French poetry as it were a new soul." It is a book of self-interpretation. The heroine is herself, and is the only living character in a story whose plot, though easy and graceful, is of no special value. Corinne, of mingled Italian and English blood, has gone from England to Rome to seek psychic emancipation in a freer artistic life than English conventions admitted. With admirable art the spirit of the two nations is contrasted, unreckoning idealism with self-satisfied calculation, passion with cant, nature with respectability, fame with wealth and ease. To Corinne as to Coleridge, all thoughts, passions, delights are but ministers of love. Glory without love is only "the bright shroud of happiness," conscious intellectual superiority rather a hardship than a boon. Yet a vision of happiness seemed always beckoning her on; and this vision made of 'Corinne,' for a whole generation of romantic spirits, a breviary of generous passion and of ideal love, none the less because the heroine dies at last, abandoning her dignity to her love, a victim to social conventionality. Here a new range of emotions gained recognition in the evolution of fiction. The artistic and musical novels of the next generation, the Teverino's and the Consuelo's, had in 'Corinne' their inspiration and exemplar. It showed, too, as no novel before it had done, how description of nature might be made to reflect and interpret the psychic moods of its characters. There are four English translations.

BENJAMIN W. WELLS,

CORINTH, Greece, a celebrated city upon the isthmus of the same name. It was renowned among the cities of Greece, commanded by its advantageous position a most important transit trade, and possessed all the splendor which wealth and luxury could create; while its citadel, the Acrocorinthus, rendered it one of the strongest fortresses of Greece. Only a few ruins remain to attest its ancient magnificence. Of the three ancient harbors the western harbor, Lechæum, on the Gulf of Corinth, is choked with sand, as is the eastern harbor, Kekhries (ancient Cenchreæ), on the Saronic Gulf. These were anciently the chief harbors of Corinth. The shallow harbor Schœnos, now Kalamaki, at the eastern entrance of the canal across the isthmus, is used to some extent. There is still a wretched village on the site of ancient Corinth. The American School of Classical studies at Athens began excavations in 1896 on the site of ancient Corinth. Few works of art were found, but the sites of the theatre, the fountains of Pirene and Glauce, the road to Lechæum, the Propylæa and the Agora were determined. In this way a basis was furnished for identifying the topography of the ancient city from the detailed description given by Pausanias. New Corinth (Nea Korinthos) stands about three miles to the northeast on the coast of the gulf, on the railway from Athens to Patras. It is a small town built since 1858, is the capital of the eparchy of Argolis and Corinth, and the seat of an archbishop. It has a harbor and custom-house. Oil, corn, currants, honey and silk are among its principal exports. The Corinth Ship Canal was opened in 1893, and has greatly aided the prosperity of the city. Pop. 5,340.

In ancient Corinth great exchange of Asiatic and Italian goods took place. The duty paid on these goods afforded a great revenue to the state; and the citizens accumulated such wealth, that Corinth became one of the most magnificent, but at the same time most voluptuous, cities of Greece. Aphrodite was the goddess of the city, and courtesans were her priestesses, to whom recourse was often had, that they might implore the protection of the goddess in times of public danger; and a certain number of new priestesses were consecrated to her at the commencement of important enterprises. Lais and several other females of the same profession were distinguished by their great accomplishments and beauty, and the high price which they set on their charms; hence the old proverb, *Non cuivis homini contingit adire Corinthum,* that is, «It isn't everyone that can afford to go to Corinth.» The virtuous women celebrated a feast to Aphrodite apart from the others.

The mythical Sisyphus was the founder of the Æolian dynasty, which is represented as the first that ruled in Corinth. It was conquered by the Heraclidæ, and Corinth was subsequently ruled by an oligarchy called the Bacchidæ, in whose time the colonies of Syracuse and Corcyra were founded. This was overthrown by Cypselus in 657 B.C. Periander was the next ruler. Corinth took a prominent part in the development of Greek colonization and was long a great naval power. In the sequel Corinth became the head of the Achæan League, and was conquered and destroyed by the Consul Mummius, 146 B.C. Julius Cæsar, about a hundred years later, rebuilt it; but its commerce could not be restored; the productions of the East now took the road to Rome. A Christian community sprang up in the city under Paul's ministrations, and to it he addressed two letters. The Venetians received the place from a Greek emperor; Mohammed II took it from them in 1458; the Venetians recovered it in 1687, and fortified the Acrocorinthus again; but the Turks, under Ali Comourgi, celebrated in Byron's 'Siege of Corinth,' took it anew in 1715, and retained it until Greece became independent. It was reduced to ashes during the Revolutionary War, and again ruined by an earthquake in 1858. Against any enemy invading the Morea from the north, Corinth and its citadel were formerly of the highest military importance, and as a fortified post it continued of importance to modern times. But by the present Greek government it has been neglected. Consult Curtius, E., 'Peloponnesos' (Gotha 1852); Wilish, 'Beiträge zur inneren Geschichte des alten Korinth' (Zittau 1887); id., 'Geschichte Korinths von den Perserkriegen bis zum dreizigjährigen Frieden' (ib. 1896). For a popular account, consult Richardson, in the *Century Magazine* (New York 1899) and Cooley, in *Records of the Past* (Vol. I, Washington 1902).

CORINTH, N. Y., a town in the Adirondack Mountains, 17 miles from Saratoga on the Hudson River. The Adirondack branch of the Delaware and Hudson Railroad connects with the town. The principal industries are the manufacture of paper and pulp, gloves and shirts. There are three schools, a national bank and a town-hall. Pop. 3,500.

CORINTH, Advance on (30 April–30 May 1862), and **Battle of** (3–4 Oct. 1862). Corinth, Miss., an important strategical point, was early occupied by the Confederates. It was the objective point of General Halleck's campaign, for which, early in April 1862, he was concentrating Grant's and Buell's armies at Pittsburg Landing, on the Tennessee River. On 3 April Gen. A. Sidney Johnston marched from Corinth with 40,000 men to strike and crush Grant before Buell could join him; surprised him on the morning of the sixth, at Shiloh; and after a severe fight drove him back to the river, where he was joined by Buell's advance division. Johnston was killed during the battle, and was succeeded by General Beauregard. Grant and Buell renewed the battle on the seventh; Beauregard was defeated, and led his army back to Corinth, having lost 10,000 men. General Halleck joined the army at Shiloh, 11 April, assumed command, drew reinforcements from every direction, and at the end of the month had 110,000 men. Grant was second in command. On 30 April the movement began on Corinth, 27 miles distant, held by Beauregard with about 50,000 men, his army having been reinforced. Early in May Halleck began to throw up elaborate works. It was a siege from start to finish, the army entrenching from the Tennessee River to Corinth. On 9 May occurred an engagement in which the

Union loss was about 180 killed and wounded; the Confederate loss about 160. Halleck continued his slow approaches, gradually gaining ground, and 28 May he was within a mile of Beauregard's main line. On the morning of the 30th it was discovered that Beauregard had made a clean retreat. At Baldwyn, 31 miles from Corinth, he remained until 7 June, when he fell back to Tupelo, 52 miles from Corinth. Halleck occupied Corinth on 30 May, and Gen. Gordon Granger's cavalry, supported by 50,000 infantry, followed Beauregard as far as Baldwyn and Guntown, and here the campaign for Corinth ended. The loss of Corinth was followed by the fall of Fort Pillow and Memphis and the opening of the Mississippi down to Vicksburg.

On 1 Oct. 1862, General Grant, in command of the Union army operating in West Tennessee and northern Mississippi, had about 48,000 effective men. Gen. Earl Van Dorn, commanding the Confederates in Mississippi, believing that a successful attack on Corinth would expel Grant from West Tennessee, concentrated Lovell's division of his own army, with the two divisions of Gen. Sterling Price's army at Ripley, 30 miles southwest of Corinth, 28 September. Next day he marched north, and arrived at 10 o'clock on the morning of 3 October, three miles northwest of Corinth, where he formed his army for attack. He had about 22,000 men. Rosecrans had been warned, and had made dispositions for the attack. In a severe action that day Van Dorn gained two miles of ground and captured two guns. The main works defending the town were close to it, and consisted of a series of heavily armed redoubts, connected by rifle-pits or breastworks. By 9 o'clock that night Rosecrans had formed his lines for the next morning's battle. It was after 9 o'clock of a still, intensely hot day, before Van Dorn attacked. The battle, which was fought with fury on both sides, did not exceed an hour in duration, and by noon Van Dorn's army, Lovell's division covering the rear, was in full retreat, from one of the most sanguinary fields of the war. Gen. Sterling Price, in his report, says: «The history of this war contains no bloodier page, perhaps, than that which will record this fiercely contested battle.» At night Van Dorn halted at Chewalla, six miles from the field, next morning hastening his march for Pocahontas to retire by the way he had come. After fighting at Davis' Bridge over Hatchie River, in which he inflicted upon the Federals a loss of 539 killed and wounded, and himself lost 127 killed and wounded, 420 prisoners, and four guns, Van Dorn crossed the Hatchie at Crum's Mill, six miles south, and took the road to Ripley, thence to Holly Springs.

The Union loss at Corinth was 355 killed, 1,841 wounded and 324 missing; an aggregate of 2,520. Rosecrans says he buried 1,423 Confederates, but the Confederate reports show a loss of 505 killed, 2,150 wounded and 2,183 missing; an aggregate of 4,838. Deducting the loss at Davis' Bridge (127 killed and wounded, and 420 prisoners), the Confederate loss at Corinth was 2,528 killed and wounded and 1,763 missing. Consult ‹Official Records› (Vols. X and XVII); Grant, ‹Personal Memoirs›; Sherman, ‹Memoirs›; Greene, ‹The Mississippi›; ‹Battles and Leaders of the Civil War› (Vol. II); Roman, ‹Military Operations of General Beauregard› (Vol. II); Force, ‹From Fort Henry to Corinth.›

E. A. Carman.

CORINTH, Gulf of, a beautiful inlet of the Mediterranean, about 80 miles long, between the Peloponnesus and northern Greece, having the Isthmus of Corinth closing it in on the east. It is better known as the Gulf of Lepanto. See Lepanto, Battle of.

CORINTH, Isthmus of, an isthmus connecting the Morea (Peloponnesus) with northern Greece. It varies in width from four to eight miles. A canal, about four miles long, was constructed across the isthmus in 1882–93, which enables vessels to sail from the Archipelago to the Adriatic without rounding Cape Matapan. See Canals; Ship Canals.

CORINTHIAN ORDER, that order of Grecian architecture of which the most characteristic feature is the capital of the column, which is adorned with beautifully carved acanthus leaves, but varies considerably in minor details. The column is generally fluted, with a fillet between the flutings, and stands upon a base. The entablature is variously decorated, especially the cornice; the frieze may be quite plain, or sculptured with foliage and animals. The Corinthian order was not very common in Greece before the time of Alexander the Great. Among the Romans it was much employed.

CORINTHIANS, Epistles of Paul to the. These New Testament letters form only a part of the correspondence known to have passed between the apostle Paul and the church of Corinth. The circumstances that called them forth and dictated their contents were of crucial importance in the early life of that church and the letters can be studied to best advantage in the light of these circumstances. It was probably early in the year 50 A.D. that Paul the missionary and apostle arrived in Corinth, the largest, wealthiest and most dissolute city of Greece and the capital of the Roman province of Achaia. Here the missionary efforts of Paul and his companions soon resulted in the formation of a flourishing Christian church in whose membership all classes of this truly cosmopolitan city were represented, although the majority were of lowly station (cf. Acts xviii, 1 ff.; 1 Cor. i, 26 f.). Paul remained with the infant church about a year and a half, leaving in the fall of 51 A.D. soon after the arrival of the new proconsul Gallio (Acts xviii, 12–18). Some time after Paul's departure Apollos, an eloquent Alexandrian Jewish-Christian visited Corinth and lent his effective aid in building up the church there (Acts xviii, 24; xix, 1). After Apollos' return to Ephesus, the church of Corinth began to be disturbed by various troubles, all due generally to the fact that the membership was quite varied in character, comprising many whose experience of Christianity was brief or only superficial. Party-strife broke out (1 Cor. i, 11 ff.), Paul's apostolic authority was even questioned by some (1 Cor. iv), and one or more cases of immorality had occurred with no censure from the church as a whole (1 Cor. v). In addition confusion of thought regarding various matters of Christian faith and practice was becoming apparent. Meanwhile Paul was at Ephesus (52–54 A.D.) busily engaged in developing a large and far-reaching missionary movement from that metropolis as a centre.

While engaged in this work, and apparently all unmindful of the troubles developing in the Corinthian church, Paul sent Titus, one of his most trusted assistants, from Ephesus to Corinth to lay before the church there his plan to collect from his Gentile churches a substantial offering for the poor Christian brethren of the old mother-church of Jerusalem (2 Cor. viii, 6, 10 f., 16 ff.; ix, 1 ff.). Titus was well received at Corinth and the church readily promised to contribute to the proposed collection. It is likely, however, that Titus noticed that all was not well with the church and so reported to Paul on his return to Ephesus. This moved Paul to write a letter, now lost, to the Corinthian church in which he urged them to take prompt measures in regard to the case or cases of immorality in their midst (cf. 1 Cor. v, 9). The effect of the letter was, however, to arouse a spirit of bitter hostility against Paul on the part of the guilty ones and their friends, who now began to spread malicious reports concerning Paul amongst the membership of the church, many of whom had been converted after Paul's departure and therefore had had no personal contact with him. This letter was written sometime in 53 A.D., upwards of two years after Paul had left Corinth.

All unaware of the extent of the disaffection toward himself Paul had also arranged to have Timothy, one of his missionary co-workers, call at Corinth in the course of an extended visitation of the churches of Macedonia and Achaia (cf. 1 Cor. xvi, 10 f.). But before Timothy arrived at Corinth a deputation of leading members of the church there, bearing with them also a letter from some portion of the membership of the church, had left Corinth for Ephesus to inform Paul of the whole situation and get the benefit of his counsel (1 Cor. xvi, 17 ff.; vii, 1). On the basis of all the information he now possessed from these and other sources (cf. 1 Cor. i, 11) Paul wrote the letter now known as the First Epistle to the Corinthians (in reality the *second* letter he is known to have written this church) in which he sought to deal fully with all the more important problems then facing the church of Corinth. In all probability Paul sent this letter by the deputation on their return. The date of the letter can be fixed approximately as late in the year 53 A.D. When Paul wrote 1 Corinthians he felt that he possessed the confidence and affection of the church-membership as a whole, although he was aware that the attitude of some was not cordial and that it was necessary to speak plainly in rebuking certain errors in which the church as a whole shared. Like most of Paul's letters this is a *letter,* not a treatise, a message directed toward a concrete situation, dealing with the actual problems of the day and intended to be read and understood by the plain, and not especially learned people of the church as then constituted. Read as such a message it is full of living interest, but if read as an abstract doctrinal treatise it cannot fail of being misunderstood.

After the usual introductory section (i, 1-9) Paul first devotes his attention to the party-strife in the church (i, 10-iv, 21). In dealing with this he points out that the church is the church of *Christ,* not of Paul or of Peter or of any other individual, and being founded upon the message of the Cross it is not based on a theory emanating from mere human wisdom; hence all party-strife and boasting is entirely out of place. His argument throughout was intended to counteract the tendency, evidently present in the church, to view the Christian faith as the product of human wisdom or theory and not as something revealed to man in his ignorance to save him. Paul passes next to advice and rebuke in reference to the offenses against Christian morality of which some had been guilty (v-vi). Then, in answer probably to written questions brought by the delegation, he discusses various aspects of the question of marriage (vii, 1-40) and also the important question as to how a Christian should regard the eating of meat that had been, in one way or another, offered to an idol (viii, 1-xi, 1). Paul's argument here involved reference to several related questions, especially the expediency of yielding one's rights in consideration of others less firmly established in the faith. Then Paul takes up the large question of the proper order and behavior in the public services of the church, criticizing the church's conduct in three particulars, (1) that some of the women prayed in public with head unveiled (xi, 2-16), (2) that there was unbecoming disorder in the observance of the Lord's Supper (xi, 17-34), and (3) that there was an unwise and unedifying use of their various spiritual gifts (xii, 1-xiv, 40). The beautiful description of love as the *way* (ch. xiii) is an integral part of this discussion. Finally, the mooted question of the nature of the resurrection body is taken up and answered at length (ch. xv). The remainder of the letter is devoted to information as to his plans and other personal matters.

It is possible that it was while Paul was writing this splendid letter that Timothy arrived in Corinth only to find that the opposition to Paul in the church there had reached a violent stage. For the moment it seemed as though the church had turned completely against him and that his influence over it was entirely lost. Timothy could do nothing and returned to Paul with a most discouraging report, reaching Ephesus after 1 Corinthians had been sent. Apparently also the return of the delegation with the message contained in 1 Corinthians was, for the moment at least, of no effect. In consequence of Timothy's report Paul at once made a hasty, but painful and ineffectual visit to his rebellious church, returning to Ephesus in great sorrow and anxiety, although not altogether hopeless (2 Cor. xii, 14, xiii, 1f.). He now had recourse to Titus, whose earlier mission to Corinth had been so successful, sending him with a letter, written in great sorrow of remonstrance and appeal. The greater part of this letter is probably preserved in the latter portion of the so-called Second Epistle to the Corinthians, namely in 2 Cor. x-xiii, 10. Such seems to be the only satisfactory solution of the remarkable difference between 2 Cor. i-ix, so full of joyful confidence and thankfulness, and chapters x-xiii, so full of pain, anxiety, apology and explanation. It is this sorrowful letter that is referred to in 2 Cor. ii, 3 f. and vii, 8-12. It was written probably early in 54 A.D. about the time of the disturbance in Ephesus caused by Demetrius (cf. Acts xix, 21-40). In this brief letter Paul first replied to the charge that he was weak and forceless (x, 1–18), then defended himself for his apparent self-glorification, pleading his special relation to them and showing that in reality he was only glorying in his weakness for it was in reality God's power and not his own that he had in him (xi, 1–xii, 10). He was compelled thus to speak (xi, 11–18) and when he should come to them again, the *third* time, they would know how strong his position was (xii, 19–xiii, 10).

Soon after Titus' departure for Corinth with this message Paul closed his work in Ephesus (June 54 A.D.) in order to make a tour of his Macedonian churches and then to pay a visit to Corinth in case conditions there became more favorable. It was probably at Philippi that Titus rejoined Paul, who had been anxiously impatient to hear from him (cf. 2 Cor. ii, 12), and brought the cheering and comforting news that the church of Corinth had repented of its errors and disloyalty and was fully prepared to follow the Apostle's advice and would be glad to see him again. Out of great joy and thankfulness Paul now wrote his *fourth* letter to the Corinthians, which we possess as 2 Cor. i–ix. The greater part of this letter (chs. i–vii) is devoted to the happy subject of the reconciliation that had been brought about through the efforts of Titus. These chapters do not reveal any carefully worked out plan. They are profoundly emotional and personal rather than deliberately didactic. For example, the thread of thought at ii, 13 is suddenly broken off, as the full significance of Titus' success impressed itself on Paul, not to be resumed until vii, 5. But in spite of this lack of logical sequence these chapters are among the richest in spiritual truth of all the Pauline letters. Here the heart of the great apostle is laid bare and the depth and sincerity of his spiritual experience is disclosed. The latter part of the letter (chs. viii and ix) is devoted to urging the Corinthians to contribute promptly and heartily to the collection for the poor saints in Jerusalem. They had promised to do this the year previous and now, as he was sending Titus back to them with this letter, he urges them to have it all ready for him (Paul) to take it with him to Jerusalem as soon as possible after his expected visit to Corinth, which expectation was realized as we learn from Acts xx, 2.

It should be said that the view adopted above as to the composite character of 2 Corinthians is not as yet generally accepted although it is receiving increasing support. To the writer it is the only theory that satisfactorily explains the references in 2 Cor. ii, 3 f. and vii, 8–12 to a sorrowful letter and also the marked difference in tone between 2 Cor. i–ix and x–xiii.

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EDWARD E. NOURSE,
Professor of Biblical Theology, Hartford Theological Seminary.

CORINTHIANS, Third Epistle of the, an apocryphal epistle or letter, which like one said to have been sent from the Corinthians to Saint Paul, were both in Armenian. Apocryphal letters or epistles made their appearance at a very early period after the death of the apostles. See APOCRYPHA.

CORINTO, kō-rēn'tō, Nicaragua, in the department of Chinandega, and the principal port of entry on the Pacific coast of the republic. A railroad, owned and operated by the government, connects it with Momotombo, at the head of Lake Managua, a distance of 58 miles. There are four regular lines of steamships which touch at Corinto, carrying passengers, mail and general cargo, and navigating the Pacific from North to South America. Owing to the intense heat and unhealthfulness of the place, very few people live there, except the government employees, steamship agents, and those employed on the railway and wharves. A "convention of peace and obligatory arbitration" was signed here 20 Jan. 1902, by plenipotentiaries of the governments of Nicaragua, Costa Rica, Salvador and Honduras. It is the residence of a United States vice-consul.

CORIOLANUS, Gaius Marcius, Roman hero, called Coriolanus because the city of Corioli, the capital of the kingdom of the Volsci, was taken almost solely by his exertions. Coriolanus became very unpopular when, during the famine which prevailed in Rome 490 B.C., he proposed to distribute the provisions obtained from Sicily among the plebeians only on condition that they would agree that the tribuneship should be abolished. Banished for this cause, Coriolanus, resolving to revenge himself upon his country, went to the Volsci and prevailed upon them to go to war with Rome before the expiration of the truce. He himself was joined with Attius Tullius in the command of their army, which immediately made itself master of the cities of Latium, and the Volscian camp was pitched in sight of Rome before troops could be raised for the defense of the city. The envoys sent by the Senate returned with the answer, that Rome could purchase peace only by the surrender of the territory taken from the Volsci. A company of Roman matrons, headed by Veturia, the mother, and Volumnia, the wife of Coriolanus, at length subdued his resolution and he withdrew his army, and lived among the Volsci until his death. On the spot where he yielded to his mother's words a temple was dedicated to Fortuna Muliebris and Valeria was its first priestess. Shakespeare, in his play of 'Coriolanus,' calls the hero's wife Virgilia, his mother Volumnia and the Volscian leader Tullus Aufidius. Consult Smith, 'Dictionary of Greek and Roman Biography and Mythology.'

CORIOLANUS, probably the latest of Shakespeare's Roman plays, dates from about 1609. Like 'Julius Cæsar' and 'Antony and Cleopatra,' its plot is derived from Sir Thomas

North's translation of Plutarch's 'Lives' (first published in 1579), of which it makes on the whole an even closer use than the other two plays. About 550 lines of North's 'Life of Coriolanus' are woven into the drama, often — as in the case of the hero's great speech to Aufidius at Antium (IV, v, 71 ff.) and Volumnia's appeal for Rome (V, iii, 94 ff.) — with only the slightest verbal change. If the accepted date, as given above, is correct, 'Coriolanus' may be presumed to be the last of all Shakespeare's tragedies. It was not printed before the appearance of the first folio in 1623, and there occupies the first place in the group of tragedies, a position analogous to that of 'The Tempest' at the head of the comedies. It is one of the longest of Shakespeare's plays (only 'Richard III,' 'Hamlet,' and 'Cymbeline' cover a greater number of pages in the folio), and it is one of the most thoughtful. Without essentially changing Plutarch's story, Shakespeare has vastly elaborated the basic theme of the conflict between plebeian and patrician, with the result that this play remains his most ambitious effort at interpreting social theory. Like Plutarch, and like the Elizabethans generally, Shakespeare sympathizes with the claims of the aristocrat in the commonwealth, but he here reflects more justly than elsewhere both the force and weakness of democracy. This aspect of the play has naturally tempted discussion. In one of his most characteristic and provocative essays ('Characters of Shakespeare's Plays,' 1817) William Hazlitt expounded 'Coriolanus' as an illustration of the uncompromising aristocracy of poetry. On the stage, 'Coriolanus' has had an eventful history. During the latter part of the 17th and through the 18th century various revised versions held the stage. The 19th century saw the gradual restoration of the original text. John Philip Kemble was famous in the play, along with his sister, Mrs. Siddons, and selected it for his farewell performance in 1817. The American actor Edwin Forrest similarly chose the rôle of Coriolanus as that in which to be immortalized in a statue.

TUCKER BROOKE,
Assistant Professor of English, Yale University.

CORK, First Earl of. See BOYLE, RICHARD.

CORK, Ireland, a maritime county, province of Munster, having Saint George's Channel south, County Limerick north, Kerry west, Waterford and Tipperary east. Extreme length, east to west, 110 miles; extreme breadth, 70 miles; area, 2,890 square miles. The coast is indented with numerous bays and inlets, of which the more important are the bays of Bantry, Dunmanus, Long Island, and Clonakilty, Kinsale and Cork harbors, and is serrated with headlands and promontories. Off the coast lie the islands of Clear, Whiddy, Dursey, Bear and several smaller. The county is watered by the Bandon, Lee and Blackwater, and numerous smaller streams. The county is rich in coal, limestone and sandstone, and some iron is mined. Pop. about 400,000.

CORK, Ireland, city, capital of the county of Cork, situated on the river Lee, 15 miles from the sea and 165 miles southwest of Dublin. Besides an upper harbor at the city itself, and quays extending over four miles in length, there is a lower harbor at Queenstown, 11 miles below. The entrance, deep and narrow, is strongly fortified on each side. Cork is the third city in Ireland, and exports great quantities of grain, butter, bacon, eggs and live stock. The principal industries are tanning, distilling, brewing and the making of tweeds and linens. There are also iron foundries and yards for the building of iron ships. The principal buildings are the Protestant and Roman Catholic cathedrals, exchange, custom-house, chamber of commerce, courthouse, Queen's College, etc. There is a naval dockyard at Haulbowline, an island within Cork harbor. Cork dates from a religious settlement in 622 and from a Danish trading settlement of the 11th century. Pop. municipal borough, 80,124; parliamentary borough, 104,496.

CORK, the external bark of a species of oak (*Quercus suber*) which grows in Spain, Portugal, France, Italy, Tunis, Algeria and Morocco, and is distinguished by the cellular texture of its bark, and the leaves being evergreen, oblong, somewhat oval, downy underneath and waved. The area over which the culture extends is about as follows: Portugal, 600,000 hectares; Spain, 300,000 ha.; Italy, 80,000 ha.; France and her African possessions, 661,000 ha., of which 426,000 are in Algiers and 82,000 in Tunis. The cork oak grows in forests in the company mostly of firs and evergreen oaks, but in a part of Tunis there are forests consisting entirely of cork oaks. The bark of these Tunisian forests is said to be of an extraordinarily excellent kind. France, Great Britain, Germany and the United States receive about 85 per cent of the total production of cork. Germany, Russia and the United States have no prohibitory duties on importation of cork and cork goods, and admit the material free or with only a trifling impost. Great Britain also permits of the free entry of cork and draws most of its supplies from France, Spain and Portugal. The last named takes the chief place in cork productions, producing nearly one-half of the total growth of the bark — about 450,000 quartels out of the million produced. The greater part of this — perhaps three-fourths — is the crude bark, while the remainder is in manufactured stoppers. Spain exports only manufactured wares. In the collecting of cork it is customary to slit it with a knife at certain distances, in a perpendicular direction from the top of the tree-trunk to the bottom; and to make two incisions across, one near the top and the other near the bottom of the trunk. For the purpose of stripping off the bark, a curved knife with a handle at each end is used. Sometimes it is stripped in pieces the whole length, and sometimes in shorter pieces, cross cuts being made at certain intervals. In some instances, after the perpendicular and transverse incisions are made, the cork is left upon the trees until, by the growth of the new bark beneath, it becomes sufficiently loose to be removed by the hand. After the pieces are detached, they are soaked in water, and when nearly dry are placed over a fire of coals, which blackens their external surface. By the latter operation they are rendered smooth, and all the smaller blemishes are thereby concealed; the larger holes and cracks are filled up by the introduction of soot and dirt. They are next loaded with weights to make them even, and subsequently are dried and stacked, or packed in bales for exportation. In the course of eight or nine years the same tree will yield another supply of cork. The quality of the cork improves with each successive stripping; and the trees continue to live and thrive under the operation for 150 years and upwards. The tree is an evergreen species of oak. It reaches the height of about 30 feet. The outer layer of bark by annual additions from within gradually becomes a thick soft homogeneous mass, possessing those compressible and elastic properties upon which the economic value of the material chiefly depends. The first stripping takes place when the trees are from 15 to 20 years of age. This first yield is woody in texture, and is useful only as a tanning substance, or for forming rustic work in ferneries, etc.

The uses of cork were well known to the ancients, and were nearly the same as those to which it is applied by us. Its elasticity renders it peculiarly serviceable for the stopping of vessels of different kinds, and thus preventing either the liquids therein contained from running out, or the external air from passing in. The use of cork for stopping glass bottles is generally considered to have been introduced about the 15th century.

The practice of employing this substance for jackets to assist in swimming is very ancient; and it has been applied in various ways toward the preservation of life when endangered by shipwreck. The cork jacket, used to preserve the lives of persons in danger of drowning, may be constructed as follows: Pieces of cork about three inches long by two inches wide, and the usual thickness of the bark, are enclosed between two pieces of strong cloth or canvas, and formed like a jacket without sleeves; the pieces of cloth are sewed together round each piece of cork, to keep them in their proper situation; the lower part of the jacket about the hips is made wide enough to give freedom to the thighs in swimming; and the whole is made sufficiently large to fit a stout man, and is secured to the body by two or three strong straps sewed far back on each side, and tied before; the straps being thus placed to enable any wearer to tighten it to his own convenience.

The floats of nets used for fishing are frequently made of cork. Pieces fastened together make buoys, which afford direction for vessels in harbors, rivers and other places. In some parts of Spain it is customary to line the walls of houses with cork, which renders them warm and prevents the admission of moisture. On account of its lightness cork is used in making artificial legs; and from its being impervious to water it is sometimes placed between the soles of shoes to keep out moisture.

In the cutting of corks (when they are made by hand, and not, as is now generally the case, by machinery), the only tool employed is a very broad, thin and sharp knife; and as the cork tends very much to blunt this, it is sharpened on a board by one whet or stroke on each side after every cut, and now and then upon a common whetstone. The corks for bottles are cut lengthwise of the bark, and consequently the pores lie across. Bungs and corks of large size are cut in a contrary direction: the pores in these are therefore downward — a circumstance which renders them much more defective in excluding air than the others. The parings of cork are used for making Spanish black, and largely in the manufacture of linoleum and similar goods. The United States imports unmanufactured cork annually to the value of over $3,000,000, and manufactured cork to the value of $2,500,000 approximately.

CORKITE, a lead ore of minor importance consisting of phosphate and arsenate of lead and ferric sulphate. It occurs in ores of Beaver County, Utah.

CORLEONE, kōr-lā-ō'nạ, Sicily, town in the province of Palermo, and 22 miles south of the city of Palermo, near the source of the Belici. It is well built, has several churches and convents, a prison, royal college and some other public edifices. The inhabitants are principally engaged in agriculture. The ancient Korliun was founded by the Saracens and colonized with Lombards by Frederick II in 1237. Pop. 19,072.

CORLISS, George Henry, American inventor: b. Easton, N. Y., 2 June 1817; d. Providence, R. I., 21 Feb. 1888. The construction of stationary steam engines was revolutionized by his improvements and a single engine made by him moved all the machinery in the centennial Exposition of 1876.

CORLISS ENGINE. See STEAM AND STEAM ENGINE.

CORM, or CORMUS, in botany, the dilated base of the stems of some plants, as the crocus, cyclamen, etc. It is commonly called bulb or root tuber, but is actually neither.

CORMON, kôr-môṅ, **Fernand,** French painter: b. Paris, 22 Dec. 1845. He studied under Cabanel, Fromentin and others, and in 1875 he received the Prix de Salon; in 1887 a medal of honor at the Salon of that year; in 1889 the Grand prize at the Paris Exposition, and became an officer in the Legion of Honor. His best-known works are 'The Stone Age' (1884); 'The Victors of Salamis' (1887); other works of his are 'Cain' (1880), and 'The Raising of the Daughter of Jairus.' A series of archæological paintings representative of human development from prehistoric times gave him celebrity, and his portraits have given him a high reputation in that branch of art.

CORMORAN, a Cornish giant in the nursery tale 'Jack, the Giant-killer.'

CORN (from French *corne,* from Lat. *cornu,* a horn, from its horny nature), a hardened and thickened portion of cuticle produced by pressure. Corns are generally found on the outside of the toes, but sometimes between them, on the sides of the foot, or even on the ball. They gradually penetrate deeper into the parts, and sometimes occasion extreme pain. No part of the human body, probably, has been injured so much by our injudicious mode of dress as the feet, which have become, in general, deformed. To this general deformity of the foot belong the corns, produced by the absurd forms of our shoes and boots. They appear at first as small dark points in the hardened skin, and in this state stimulants or escharotics, as nitrate of silver (lunar caustic), are recommended. The corn is to be wet and rubbed with a pencil of the caustic every evening. It is well to have the skin previously softened. If the corn has attained a large size removal by a cutting or ligature will be proper. In all cases of cutting corns very great precaution is to be observed. The feet ought always to be bathed previously. Mortification has, in many instances, resulted from the neglect of this precaution, and from cutting too deep. An efficacious remedy for corns is the application of glacial acetic acid night and morning. This acid has a peculiarly destructive effect on the epidermis, of which corns are a hypertrophy. Salicylic acid is also an excellent application. A simple and generally very efficacious means of alleviating the pain caused by corns and removing the cause for their growth is the application of a thick adhesive plaster, in the centre of which a hole has been made for the reception of the projecting part.

CORN, grain, such as wheat and barley; maize, or Indian corn; also the plants that yield grain; breadstuff. This is a generic term for all kinds of grain used for making bread, and is applied specifically to the principal breadstuff; in England to wheat, in the United States to Indian corn or maize, and in Scotland frequently to oats. The word is Anglo-Saxon, and occurs in similar forms in the other Teutonic tongues. The words seem to have been used in ancient times as at present, having a different meaning in different countries.

Indian corn, also called maize, is an endogen which grows luxuriantly in warm temperate climates. It belongs to the tribe of *Phalaridæ* of the order of *Gramineæ*, or grasses. It is known in botanical science by the name *Zea mays*. The flowers are monœcious; the male flowers forming a loose panicle at the top of the culm; the female flowers in axillary spikes, enclosed in large, tough spathes, from which only the extremely long styles — in the common species six to eight inches in length — hang out like tufts of feathers or silken tassels. The grains are large, roundish, compressed, naked and arranged in parallel rows along the upright axis of the spike. The long parallel-veined leaves and the stalks are often used as fodder. The common Indian corn is generally believed to be a native of the warmer parts of America, where it was cultivated by the aborigines before the discovery by Columbus; but a representation of the plant found in an ancient Chinese book in the royal library in Paris, and the alleged discovery of some grains of it in the cellars of ancient houses in Athens, have led some to suppose that it is a native also of the East, and has, from a very early period, been cultivated there, and even that it is the «corn» of Scripture; although, on this supposition, it is not easy to account for the subsequent neglect of it until after the discovery of America, since which the spread of its cultivation in the Old World has taken place with a rapidity such as might be expected from its great productiveness and other valuable qualities. Columbus himself took it to Spain. When first introduced into Europe, many supposed it was brought from Asia, and it was frequently known as Turkey corn, Turkey wheat.

Sweet corn is any one of the starch corns, flint, dent or flour corn, that has lost its faculty of converting sugars into starches. It is grown chiefly as a vegetable for table use, although the stover is often harvested as forage for stock. Its culture is most extensive in the vicinity of large cities, where it is grown as a truck crop and in certain regions where it is grown as a canning crop. The principal canning variety is a late corn, Stowell Evergeen. Country Gentleman is also used to a large extent among the canners. In Maine, a corn known as Clark's is used for canning. Hickox and Trucker's Favorite are the principal canning varieties in other regions. In the suburban truck gardens the custom is either to plant early and late corn, or one high-class variety every two weeks. Cory, Crosby, Quincy Market, Country Gentleman and Stowell Evergreen are often planted in the order named. According to the latest census the number of farms growing sweet corn in the United States was 48,514, the number of acres 178,224, the value of the product $5,936,419. New York had 6,584 farms producing sweet corn to the value of $942,023. Pennsylvania was second with 4,896 farms. Illinois had the second place in number of acres, with 19,976 acres and second in value of product, which was valued at $558,746. Ohio, Maryland and New Jersey are next in importance. The corn-canning industry flourishes in Illinois, Indiana, Iowa, Maine, Maryland, New York and Ohio.

In 1915 the amount of Indian corn produced in the United States was 3,054,535,000 bushels (final estimate, 15 December), and in 1914 it was 2,672,804,000 bushels. Argentina in 1914 produced 204,562,000; Mexico, 190,000,000; Rumania, 110,230,000; Italy, 105,006,000 bushels. Estimate for the maize crop of the world, 4,000,000,000 to 4,500,000,000 bushels.

CORN CLUBS, organizations promoted in 1916 in the rural districts of the United States, for the purpose of arousing interest in the scientific culture of corn and other agricultural products among the country boys and girls; and to supply wholesome recreational activity for the members. These clubs were founded in connection with the general movement for rural recreation.

CORN-COCKLE (*Agrostemma githago*), a plant of the pink family (*Silenaceæ*). It is an annual, pubescent, often branching herb, from one to three feet tall, distinguished by its large purple flower. Though a native of Europe and western Asia, it is now found in most temperate regions, frequenting grain-fields and waste places. When its seeds become mixed with those of the grain, and are ground with them, it is said to effect and render the grain unwholesome; thus it requires to be separated from the grain by a special kind of sieve. In Germany the seed when ripe and dried is called schwartz-kümmel (black cumin), and is sold for medicinal and domestic purposes.

CORN-CRAKE (that is, «corn crow,» because of its cry), the common name in England of a small rail (*Crex pratensis*) which frequents meadow lands throughout Europe; also called landrail. The name crake is applied to various other birds of the family *Rallidæ*, which differ from the typical rails in having a shorter beak. In the United States the common rail (*Porzana carolina*) and allied species are occasionally so called. They are secretive birds, abundant in reedy swamps, and are much sought by gunners in the fall of the year.

CORN CULTURE. The profitable production of corn depends upon: (1) fertility of soil; (2) conditions of climate; (3) quality of seed; (4) methods of cultivation.

Fertility of soil is the first and most important of these conditions. Three elements, nitrogen, phosphorus and potassium, are important constituents of soil fertility, and the ones which are frequently lacking in quantity in the soil's composition, or become quickly exhausted by continuous cropping without proper rotation of crops or application of manures. In those regions where corn is most extensively grown, as in the Mississippi Valley of the United States, the fertility of the virgin soils seemed almost unlimited to the pioneer farmers, who in many instances grew crop after crop of corn, selling the product off the land without apparently diminishing the productiveness of the soil. However, after a half century of such practice, it has been found that the soil has been exhausted by this system of farming. The depleted soils are found to have an insufficient supply of the important elements necessary to render them fertile, and it has become necessary to resupply them directly in the form of commercial fertilizers, or indirectly, through the use of barnyard or other like manures, or by the growing of green manure crops.

Methods of Restoring or Maintaining the Fertility.— There are several methods which are practised with economical results in the corn belt of restoring exhausted corn lands to a fertile condition, and of keeping up the fertility of such soil under cultivation. It will be impossible to treat of many of them in detail here, so that only a few of the principal plans will be outlined.

Commercial Fertilizers.— The use of commercial fertilizers for corn land is limited to those soils which are lacking in one or more constituents of plant food which can be bought in the market, either alone or in combination, at a reasonable cost, usually, nitrogen, phosphorus, potassium or lime. Their general use is limited from the fact that the cost of supplying plant food in this way is so great that the returns in crops like corn do not usually justify the outlay. Nitrogen, phosphorus and potassium now bring a high price per pound, when purchased in artificial fertilizers. From the fact that a large quantity of these constituents are removed in a crop of corn it can be seen that it would be unprofitable to use them for the growing of a crop without having as a basis a soil naturally sufficiently supplied with one or more of these elements. In some cases it may be advisable to apply one or more of these constituents to correct some unusual soil condition, but the large areas which are naturally rich in all necessary elements of plant food for corn, and adapted in all conditions for growing corn, preclude their general use for this purpose by the corn growers of the United States.

Barnyard Manure.— Barnyard manure contains a large supply of plant food, and when applied to the soil not only increases its fertility but improves the mechanical condition, or tilth, as well. The large amount of straw and vegetable matter in its composition, when decomposed and assimilated by the soil, improves its condition for corn crops. In fact it has come to be a generally followed practice among our most progressive farmers to feed the corn crop to live stock, carefully conserving the manure for application to the soil. In such cases, the best plan seems to be to compost the manure, and after it has become well-rotted, to spread it on the field while the soil is frozen in winter, plowing it under to a good depth in the spring. This practice can be followed only where local conditions permit. On soils that leach or are carried off by rains it is necessary to apply the manure at the times when it will not be washed off the soil by winter or spring rains, or wasted from other causes. In such cases, the manure may be spread on grass lands or pastures in the spring or summer, the field being plowed for corn the following autumn or spring. About 10 tons of well-rotted manure per acre is considered a sufficient application for ordinary corn land.

Green Manure Crops.— The most important method of maintaining the soil's fertility is by the use of green manure crops, such as clover, cowpeas, soy beans and alfalfa. These crops add to the supply of nitrogen in the soil under favorable conditions and when plowed under improve its tilth. When harvested they constitute a valuable feed for live stock. The addition to the plant food supply of the soil by the growth of leguminous crops is accomplished in two ways: Firstly, by the presence and growth of certain organisms peculiar to these crops, inducing the development of root tubercles. These organisms have the power of drawing upon the free and unavailable nitrogen of the atmosphere and converting it into an available and useful condition for plant food. Secondly, from the fact that these crops root deeply as a rule, drawing upon plant food in the soil, which is not in position for use by ordinary crops. This food is assimilated by the plants, so that when the crop is plowed under the decomposition of the roots and stems leaves this plant food where it can be gotten at and used by corn or other plants.

Cowpeas and soy beans are leguminous crops, introduced into this country recently from Asia, and are coming to be grown on a large scale as green manure crops for the preparation of the land for corn.

In summing up the important points as regards the condition of the soil for corn, it may be said that continuous cropping without rotation or manuring seems inadvisable, and results in the exhaustion of the fertility of the land to such an extent as to render it an expensive process to bring it back to a state of productiveness. Commercial fertilizers are expensive agents for maintaining the food supply for corn, and cannot be successfully used except for local or peculiar conditions or for the correction of some unusual occurrence, as the acidity of certain bog soils, or the small alkaline areas in the fields in certain sections of the Middle West. The most successful and profitable plan adapted to most conditions seems to be a rotation of corn with some legume, preferably one which can be used to supplement corn as a ration for live stock, and the feeding of all crops followed by the return to the soil of the plant food in the shape of composted manure.

Climate.— *Zea mays* originated in all probability in Mexico. From Mexico it was carried north by the Indians by means of barter and trade, so that when the early explorers of America visited the section now included in the United States they found considerable areas under a crude system of corn cultivation by the

Indian tribes. Upon the development of the vast sections of the Mississippi Valley corn became the principal crop, and is now recognized as the leading American cereal. From America this crop has been carried to all continents of the world, and is grown to a greater or less extent in most of the leading countries, especially in those in which the climate and soil conditions are similar to those of our Mississippi Valley region. Corn flourishes best in those sections having an annual rainfall of about 30 inches, or an artificial supply by irrigation, and a season of about 120 days for the maturing of the larger types. The crop seems to reach its best development in the temperate regions, where a part of the season, the time of greatest growth, has warm days and nights. Under such conditions the plants grow with great rapidity. Corn readily responds to climatic conditions; namely, by taking a late variety to a region of short seasons, an early variety can be developed by selection, and vice-versa. For this reason, we have races of corn which vary greatly in their characteristics, due to the adaptation to climatic conditions. It is not a good policy suddenly to remove a race suited to a peculiar set of conditions to very different conditions. Under such circumstances the crop may fail to mature, or may develop some quality detrimental to its value. It is probable that by selection races may be improved for any given corn region, and that by continued breeding and selection, these races may be further improved without resource to the importation of seed from other sections. However, it seems that there are certain conditions in which corn naturally reaches its highest and fullest development, and it is probable that in those sections most advance will be made in the permanent improvement of corn. It may be advisable for corn-growing sections not specially suited for corn growing occasionally to secure a small supply of breeding seed from the best corn regions, which after a few years' growth will have become suited to the new conditions and may have a better type than those which have been grown in the less favorable localities.

One of the important things which has been neglected for the most part, in so far as climatic conditions are concerned in corn culture, is the systematic comparison of different races from different regions, in order to find those races which are the best naturally suited to local conditions. It is probable that before breeding is begun, it would be advisable to make such a test in order to determine the best breeding stock for permanent improvement.

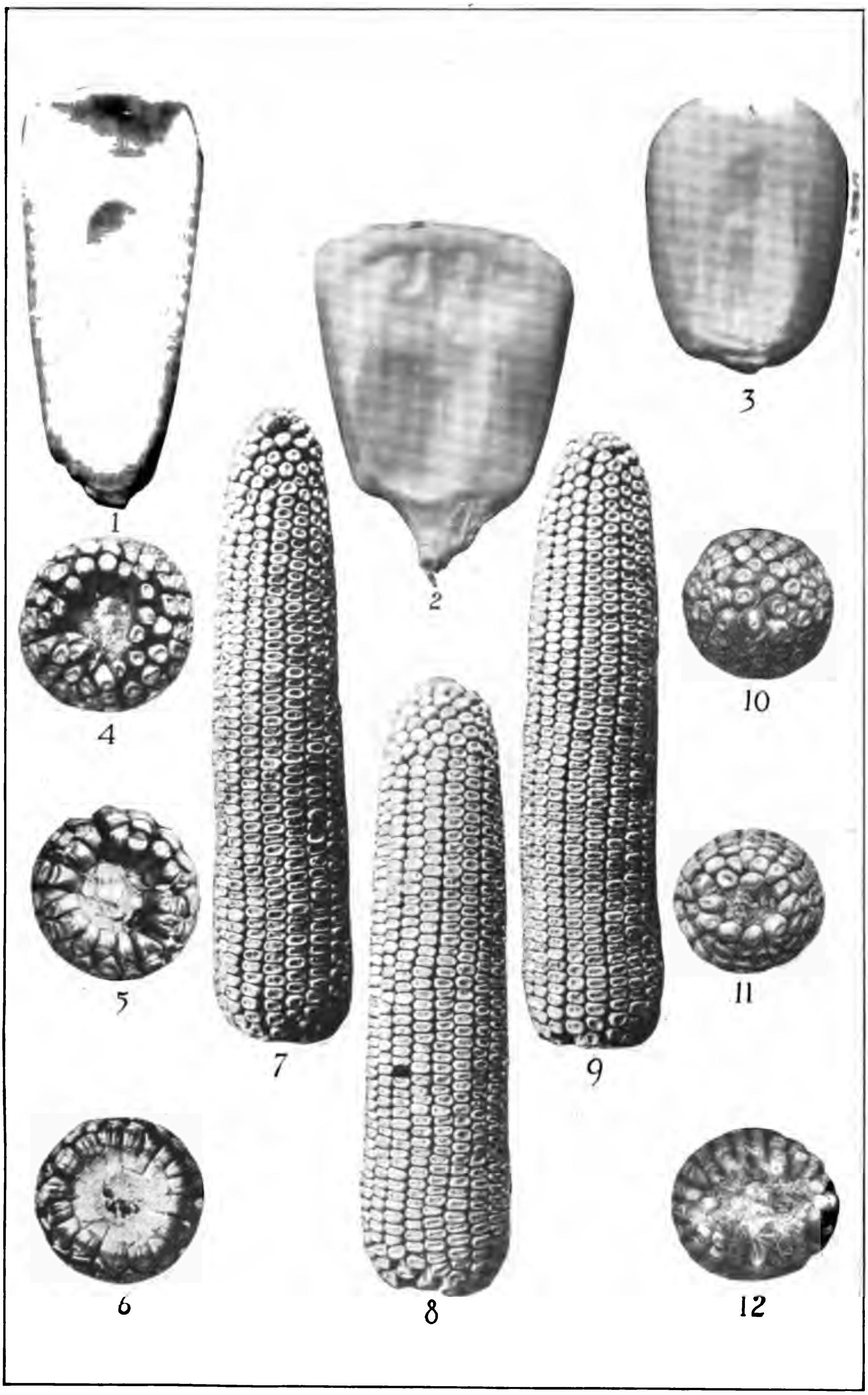
Quality of Seed.— There are a number of races of dent corn (*Zea indentata*) which for the most part are the result of the selection of sports or striking variations. The individuals of these races are not uniform, and from the fact that corn is normally cross fertilized, a pure race frequently becomes mixed with other races. In fact there are practically no pure races under general cultivation, and owing to the difficulty of maintaining the pure type, little attention has been given to systematically breeding these races. As a rule the seed corn used for planting the crop of the world is subject to little, if any, intelligent selection of seed ears. Considerable fraud has been practised by unscrupulous seed dealers in the past, who, in order to humbug the public, bought up ordinary corn, gave it a fancy name, advertised it widely without careful tests and, through extravagant claims for its productiveness, obtained a wide sale, with consequent loss to the farmers buying the seed, but with considerable financial gain to themselves.

Pioneer Corn Breeders.— Previous to 1900, little was done in the way of the systematic improvement of corn. A few men early in the last century realized the value of carefully selected seed, and began to select their corn with reference to some type particularly desirable to them. One of these men was James Leaming, of Wilmington, Ohio, who began the selection of the ordinary yellow corn of the Miami Valley for larger and heavier ears. His idea was to secure ears with small cobs, deep grains well filled over the tips and butts, which would mature under his conditions of soil and climate. In order to get early maturity he naturally selected a rather tapering type of ear. This seed was carefully preserved during the winter, and all irregular kernels, such as tip and base kernels, were discarded before planting. Mr. Leaming began this work about 1825, and continued the selection of this type of seed for more than half a century, keeping the race as pure as possible. Some of the pioneers of Illinois, Iowa and other Western States carried seed of this race with them from Ohio to their new homes. It was found that under the very favorable conditions of the Mississippi Valley this race improved in size of ear, depth of kernel and productiveness. Naturally, it was carried over a large territory and during the past few years has been the subject of considerable attention by corn breeders who have effected further and marked improvement in the feeding quality and yielding power. The Improved Leaming strains of to-day bear little resemblance to the original Ohio stock, and are living evidences of the possibilities in careful selection of seed corn.

Another pioneer in the work of the improvement of corn and the establishment of new races was James Riley, of Thorntown, Ind. Mr. Riley began the selection of the ordinary white corn of his community about the middle of the last century. He was convinced that by the selection of large, well-developed ears for seed, and the weeding out of barren stalks before pollination, a large-eared, uniform type of corn could be secured. By persistent planting of such seed ears in isolated fields, preventing mixture with other types, he achieved success in this work, and produced a race called the Boone County White, which stands foremost among all races of white corn grown in the corn belt. Other races were produced by Mr. Riley, among them a yellow type, which he called Riley's Favorite. The production of this race is interesting because it illustrates the development of new types by crossing, and fixing of type of the hybrid by selection. He crossed a large and late Southern race of yellow corn on a small, early maturing, Northern yellow race, his aim being to secure a new race having a medium or large ear and early maturity. He accomplished this object successfully, and the Riley's Favorite is now largely grown in northern parts of the corn belt.

Improved Races are Most Productive.— The results of these systems of selection are

CORN



1 Wedge-shaped kernel. A desirable type
2 Square kernel. Undesirable type
3 Round kernel. Most undesirable type
4 Well-filled butt of ear. A desirable type
5 Medium-filled butt of ear. An undesirable type
6 Poorly-filled butt of ear. Most undesirable type
7 Cylindrical ear with straight rows of uniform kernels
8 Cylindrical ear with straight rows of uniform kernels
9 Nos. 7, 8 and 9 illustrate a desirable kind of selection of uniform ears
10 Well-filled tip of ear. A desirable type
11 Partly uncovered tip. Undesirable type
12 Most undesirable type of tip of ear, poorly filled with irregular and small kernels

shown by the comparative tests of races of corn at the Illinois and other State agricultural experiment stations. It has been found that during a series of 10 years' tests of comparative yields per acre, the Leaming and Boone County White varieties of corn have consistently and on the average for 10 years outyielded all other races. In fact, it has been shown that under widely different conditions these two races have yielded more than double the amount of the ordinary types of corn. It has further been shown that corn growers who have selected these races for feeding purposes have naturally selected the types which were most beneficial for feeding purposes, and have developed strains which have a chemical composition better suited for feeding than the ordinary races of corn now grown in any region.

The benefits of improved seed corn are that larger returns are secured with the same effort required to produce ordinary and smaller yields. It does not cost any more to grow a race of high yielding power, possessing a desirable proportion of protein for feeding purposes, or of oil and starch for manufacturing purposes, than to grow the ordinary types of corn. Taking into account the great area devoted to corn in the United States, even a slight increase in yield per acre, or a small improvement in quality, means an enormous increase in the profit from breeding. The past few years have demonstrated the practicability of such improvement beyond a doubt, and the results obtained on the farms and by experiment stations have attracted world-wide attention.

Corn Breeders' Association.— The organization of the Illinois Seed Corn Breeders' Association, in June 1900, marked the beginning of a widespread attempt to put corn breeding on a similar basis to that of live stock breeding. In fact, it has been found that corn breeding follows the same general laws as the breeding of animals. In other words, corn can be bred like cattle. This organization was founded by a few men, extensive growers of corn, and in most cases, noted breeders of live stock, who resolved to begin a careful selection of their own seed for planting, and if favorable results were obtained to offer such seed for general planting in regions suited to the development of the races they selected for breeding. All seed sent out by members of the Association was carefully inspected by an officer of the State Experiment Station, tested for vitality, and examined for uniformity, trueness to type and freedom from mixture with other types of corn. All seed sold was sent out in the ear so that the man who purchased the seed could see for himself the type and character of the seed sent to him. The success of the plan was so great that other States at once followed the lead of this organization, and at present Iowa, Kansas, Nebraska, Indiana and Maryland have corn breeders' associations, comprised of men who are systematically selecting their corn, for the most part in co-operation with the State Experiment Station. By means of such organized efforts, States have appropriated large sums of money for further experiments in corn breeding and culture so that progress is being made in this work at a rapid rate and valuable results are obtained of wide application and importance.

Some Standard Races of Corn.— The Illinois Seed Corn Breeders' Association recognizes eight distinct races of corn, which are the basis for the development of many strains produced by individual breeders. These races, date of beginning selection, originators and place of origin are as follows:

Boone County White, 1876, James Riley, Thorntown, Ind.

Silver Mine, 1890, J. H. Beagley, Sibley, Ill.

White Superior, 1880, P. R. Sperry, Monmouth, Ill.

Leaming, 1826, J. S. Leaming, Wilmington, Ohio.

Reid's Yellow Dent, 1846, J. L. Reid, Delavan, Ill.

Golden Eagle, 1871, H. B. Perry, Toulon, Ill.

Riley's Favorite, 1885, James Riley, Thorntown, Ind.

Pride of the North, about 1890, F. A. Warner, Sibley, Ill.

From the growing of these races under widely varying conditions, and the effect of selection by individuals having different types in mind, a great many strains have been developed, which in time will probably come to be recognized as distinct races. New races will probably spring up as a result of the selection of naturally prepotent individuals whose projective efficiency is great enough to impress distinct characteristics upon the offspring and create new and dominant types. An illustration of this method of origin of new and dominant races from striking individuals is found in the history of the Silver Mine race. According to the statement of the originator it sprung from a single ear, which was of such perfection that it attracted this grower's attention among an exhibit of several thousand ears of corn. This ear was carefully planted in an isolated patch and the crop carefully harvested and planted the next season in isolated fields. From this source the seed was obtained for the first general distribution, which has been followed by breeding experiments, and breeders taking up the race for continued improvement by selection.

One further result of the organization of corn breeders' associations has been the holding of exhibits of samples of corn selected by men who compete for certain prizes. In several instances the number of samples brought together in such exhibits has exceeded several thousand, and in one or two instances the number of samples of 10 ears each has reached 10,000. The effect of such exhibits has been to awaken a wide general interest in improved types of corn and the methods and standards for judging these samples. During the past 10 years score cards and standards of perfection have been devised, which by continued revision have been developed to a state of great usefulness. The use of the score card is to compare, on a uniform basis, individual samples of a given race of corn. Owing to the fact that in the production of races for different purposes, and for different conditions, characteristic differences in shape, size and other qualities have been developed, it has become necessary to have a standard for each of the established races.

In order to show some of the characteristics which go to make up a type, which are considered in the study of a race, the following table of characteristics of seven leading races of corn is presented.

NAMES OF VARIETIES.

	Reid's Yellow Dent	Golden Eagle	Riley's Favorite	Leaming	Boone County	Silver Mine	White Superior
Ear: Shape	Slowly tapering	Slowly tapering	Slowly tapering	Tapering	Cylindrical	Cylindrical	Slowly tapering
Length	10 inches	9 inches	9 inches	10 inches	10 inches	9 inches	10 inches
Circumference	7 inches	7 inches	7 inches	7 inches	7½ inches	7 inches	7 inches
Kernel: Condition	Firm upright	Loose upright	Firm upright	Firm upright	Firm upright	Firm upright	Firm upright
Color	Light yellow	Deep yellow	Deep yellow	Deep yellow	Pearl white	Cream white	Starch white
Indentation	Medium smooth	Very rough	Rough	Rough	Rough	Very rough	Medium rough
Shape	Long wedge	Broad wedge	Medium wedge	Medium wedge	Medium wedge	Broad wedge	Very broad wedge
Rows: Number	18–24	16–20	16–20	16–24	16–22	16–20	18–20
Space	Narrow	Medium	Medium	Medium	Medium	Narrow	Medium
Arrangement	Pairs	Distinct	Pairs	Pairs	Pairs	Pairs	Pairs
Butts: Filling out	Deeply rounded, compressed	Moderately rounded, compressed	Moderately rounded, compressed	Moderately rounded, compressed expanded	Moderately rounded, compressed	Moderately rounded	Shallow rounded, depressed
Tip: Filling out	Regular rows of kernels	Regular rows of kernels	Regular rows of kernels	Irregular rows of kernels	Regular rows of kernels	Regular rows of kernels	Regular rows of kernels
Shank: Size	Small	Small	Small	Medium	Medium	Small	Medium
Cob: Size	Medium	Small	Small	Medium	Medium	Small	Medium
Color	Deep red	Deep red	Deep red	Deep red	White	White	White
Per cent of corn	88	90	90	88	86	90	88

Vitality of Seed.—One of the most important factors entering into the production of the corn crop is the vitality of seed. In planting the ears in individual rows or plats, one of the most notable facts which strike the observer is the great irregularity of size of plants in the different rows. One row, for instance, will be on the average a foot higher than the adjoining row and so on throughout the entire field. This irregularity in growth and finally in productiveness was not shown in the seed ears, because in most cases the seed ears were so carefully selected for uniformity that they were absolutely alike to the casual observer. This difference in vigor of growth is due, in great measure at least, to differences in the vitality of the seed. This vitality means the life of the seed, which is affected by age, storage, heredity and many other factors. The degree of vitality by the seed ear can be partially measured before the seed is used for planting. No absolute measure can be made of the value of the seed ear, but a comparatively accurate idea may be gained of the vitality by means of the germination test. We believe that the kernels in the individual ear are considerably alike in composition and in vitality, in fact in all general characteristics. It has been found that there is a slight variation between the individual kernels in the ear, but that this variation is not as great as the variation between different ears; so that by testing the vitality of the individual ears the most vigorous may be picked out for planting the breeding field. This test can be made by taking out three kernels from near the tip, three from near the middle and three from near the butt of every ear. In cases where possible, it is more desirable to shell off two rows of kernels from each ear and test all of the kernels in each row. The kernels should be planted in moist sand, point down, or laid between layers of moist cloth. In this moist condition, and under a temperature of about 70° F., 95 per cent of the kernels should sprout inside of three days, and should have sprouts one inch long at the end of five days. If the seed germinates more slowly than this standard it is an indication of weakened vitality. In other words, the time required for germination is the indication of the degree of vitality. Weak seed of slow germination should be discarded, as it results in a poor stand, the most frequent cause of loss of profits to the grower.

Effect of Methods of Storing Seed Corn.—The usual practice among corn growers is to select the seed corn out of the general crib, in the spring just before time for planting. In some instances, especially during years unfavorable for the maturing of the corn crop, it has been found that such seed was weak in vitality and only a partial stand was secured. In fact, it has been found that seed corn containing a high per cent of moisture is most easily affected by cold weather, while well-dried seed is capable of withstanding cold with the least possible loss of vitality. The amount of moisture in seed varies with the conditions of maturity, immature seed containing an unusually large amount of water, while fully matured seed contains a low per cent of moisture. The dryness of the seed when harvested does not always indicate the amount of water contained, as corn absorbs moisture from humid atmospheres, and imparts it to dry air.

Methods of Cultivation.— The methods of corn cultivation vary with the conditions of soil and climate. No definite rules can be laid down for all conditions, in fact, every corn grower must determine for himself the best methods suited to his peculiar conditions. However, there are certain general principles of plant growth which hold true under all conditions, and it will be the object of this discussion to point out the practical application of some of these principles.

Methods of Preparing the Seed Bed.— The methods of preparing the seed bed for corn can best be illustrated by the results of an experiment to test this point, conducted by the Illinois Agricultural Experiment Station, during the season of 1903. The experiment resulted as follows:

EFFECT OF PREPARING THE SEED BED.
(Yield in bushels per acre.)

	Trial No.	Field	Field	Field	Average
A. Plow, *drag, let lie, disc, harrow, plant..	1	65.3	71.3	49.9	
	2	72.1	77.3		
	Ave.	68.7	74.3	49.9	64.3
B. Plow, let lie, harrow, plant..........	1	77.4	96.6	43.0	
	2	70.0	74.0		
	Ave.	73.7	85.3	43.0	67.3
C. Disc, plow, drag, disc, harrow, plant..	1	72.7	134.7	46.2	
	2	69.4	73.3		
	Ave.	71.1	104.0	46.2	73.8

* By drag is meant the implement made of boards or timbers which is used for smoothing the surface of the seed bed and to crush lumps of earth.

This table and general experience goes to show that in the ordinary season it pays to disc or stir the land before plowing, plowing to a depth depending upon the nature of the soil, and keeping the land stirred until the time of planting. This constant stirring of the soil breaks up the capillarity and prevents the escape of soil moisture, at the same time getting the seed bed in good mechanical condition for the reception of the seed.

Conservation of Soil Moisture.— In the first place it is necessary to supply the corn crop with a large supply of water for growth. It has been estimated, by careful experiments, that for every pound of dry matter produced the plant uses 300 or more pounds of water. When one considers the great yield of the corn crop in large areas and the necessary amount of water to produce this yield, it can easily be seen how important the conservation of soil moisture becomes. The moisture in the soil escapes by capillarity and by drainage. In order to prevent the loss by capillarity, it is necessary to break up the soil condition which conduces to capillary action. This is practically accomplished by plowing and continued stirring of the surface of the plowed land during dry periods, or by the use of the disc or cultivator. The loss of water by washing or drainage is prevented as far as possible by bringing the land into such condition as readily to take up and hold the rainfall and all moisture that falls upon it. This latter plan is accomplished by sub-soiling, deep plowing at the proper season, growing of such crops as clover, cowpeas, etc., in the rotation, and the addition of humus to the soil, as by plowing under corn stalks, straw, barnyard manure, or other means. When the soil is in good condition and rich in plant food, it is probably in the best possible condition to retain the soil moisture for the use of the crop.

Thickness of Planting.— The thickness of planting best suited to give the most profitable results will depend upon the race of corn, the nature of the soil, the character of climate, the purpose for which the crop is produced and other factors. However, if yield alone is considered, the following table gives the most reliable data yet obtained on this point:

EFFECT OF THICKNESS OF PLANTING.
(Yield in bushels per acre.)

No. stalks per hill	Field 1	Field 2	Field 3	Field 4	Field 5	Average
1..........	28.7	41.5	42.6	55.5	36.3	40.9
2..........	55.0	79.9	67.3	72.8	53.3	65.7
3..........	67.4	88.8	86.6	86.2	59.6	77.7
4..........	73.1	82.8	90.4	88.4	53.0	77.5
5..........	84.5	89.1	98.8	90.2	53.0	83.1

This table indicates that which has been found to be true under general conditions that four to five stalks on good corn land with ordinary seed will give the largest yield, but where machinery is not used in harvesting it is probably more desirable to leave three stalks. With three stalks bearing large ears, less difficulty and expense will be found in harvesting than with more stalks producing small ears.

Hills v. Drills.— There are two general systems of arranging the seed in the row generally followed, first grouping from two to five kernels in hills some distance apart, second, drilling the seed one seed in a place, along the row closely together. The practice of drilling seed corn was the early method of planting employed by pioneer farmers. In the new countries, which were comparatively free from noxious weeds, it was not found necessary or practicable to cultivate the corn fields as carefully as is now the case in the more fully developed sections. The farmers wished to secure the largest possible yield, and so drilled their seed corn in such a manner as to secure an unusually large number of stalks in the row. As a result large yields of small ears were obtained. Upon the further development of these communities, foreign weeds were introduced and with the lessened fertility of the soil, due to continuous cropping, more careful methods of cultivation became necessary. Consequently, the corn for the most part came to be planted in hills, admitting of cross cultivation, and frequent stirring of the soil keeping the surface comparatively level. In tests of the two systems, equal numbers of stalks being retained in the hilled and drilled rows, there has been found to be little difference in the yield per acre.

Lister v. Planter.— In some sections, particularly in the States of Kansas and Nebraska, the seed corn is planted with listers. A lister is a plow and planter combined, which opens a furrow, drills the seed corn in this furrow and covers the seed at the same time. It is therefore the means of planting large areas in a comparatively short time and at a small expense. From the extensive use of the lister in these regions, with apparently good results, the practice has spread to other States where it is now under trial. Experience has suggested certain modifications of the original simple plan, one of which is to plow the land early in the spring, and when ready to plant, use the lister instead of the ordinary methods of preparation of the seed bed and planter. Another method is to open up furrows through the fields with the lister, very early in the spring, without planting, then later list again, opening new furrows between the first ones in which the seed is drilled. It has been found that in these older districts this method is not as successful as the plowing of the land and thorough preparation of the seed bed. It corresponds to planting the seed in a dead furrow. Where it is necessary to plant the seed deep in the ground to get moisture for germination, it is probable that this system may be valuable. On sandy soils it will probably succeed, while in the heavier clay or clay loam soils it does not give the best results.

Root Injury During Cultivation.— The vital principle of cultivation of the growing corn plant is that the plants be allowed to grow undisturbed and without competition of other plants, with sufficient stirring of the surface soil to prevent the rapid evaporation of soil moisture. In an experiment with pruning or cutting off the roots of the corn plant at the Illinois Agricultural Experiment Station striking results followed such injury.

EFFECT OF ROOT PRUNING ON CORN. AVERAGE OF THREE YEARS' TESTS.

(Yield in bushels per acre.)

Plants not pruned	62
Plants pruned two inches deep	60
Plants pruned four inches deep	45
Plants pruned six inches deep	30

It can be readily seen without further explanation that injury to the roots interferes in the plant's development and reduces the yield.

Depths and Systems of Cultivation.— The cultivation of the growing crop presents many problems differing according to the conditions of soil and climate. The general results of four years of tests of different methods of cultivation, indicating in a general way the effect of different systems in the corn belt, is epitomized in the following table. There was found in these experiments a close correlation between the theory of cultivation and the results obtained by following out the methods suggested by the foregoing discussion.

EFFECT OF DIFFERENT SYSTEMS OF CULTIVATION. AVERAGE OF FOUR YEARS' TESTS.

(Yield in bushels per acre.)

METHOD	
Weeds allowed to grow	58
Weeds cut with hoe and a loose mulch made with hoe frequent cultivation	96
Two inches deep cultivation (small shovels)	90
Four inches deep cultivation (small shovels)	91
Six inches deep cultivation (small shovels)	84
Six inches deep cultivation (large shovels)	87
Gopher or blade cultivator	88
Deep early and shallow late	85
Shallow early and deep late	89
Mulched with grass	92

The results of the above trials indicate that all competition with weeds must be prevented, from the fact that they live upon the same elements of fertility as the corn plants, and in this way reduce the yield of the corn crop. Deep cultivation injures the roots of the corn plant and reduces the yield. Shallow, frequent cultivation, removing the weeds, keeping a soil mulch on the surface of the soil, gives the best results. This conclusion agrees in general with the facts of ordinary practice in well-drained and fertile soils. In very weedy fields, undrained and in poor condition, it may be necessary to cultivate deeply in order to destroy the weeds, open the soil to the air and sunshine and allow the excessive water to drain off.

In summing up the important facts of cultivation, the following points should be emphasized:

1. The preparation of the seed bed should be such as to best conserve soil moisture, and obtain the most favorable mechanical soil condition.
2. The cultivation of the growing crop should be such as to avoid all root injury, maintaining a loose surface soil mulch, and preventing the presence of all weeds or competing plants.
3. The method of planting and caring for the crop will depend upon local conditions to such an extent that it is necessary for every grower to make a thorough study of his peculiar conditions of soil and climate in relation to his methods of cultivation.
4. The conditions of growth for the corn crop are moisture, heat, light and plant food. The supplying of the conditions in the most favorable manner to the corn plants is the business of the grower and will have the largest profitable returns. Corn is more easily protected from its animal and insect enemies than most of the important crops. Of those insects that attack the roots and larvæ all are gotten rid of by rotation. Fall plowing disposes in great part of the cutworm. For ear rot the sole remedy appears to be the gathering up and burning of all affected material. Consult Montgomery, 'Corn Crops' (New York 1913); Bowman and Crossley, 'Corn' (Waterloo, Iowa, 1911).

CORN INSECT-PESTS. The principal enemies of corn are the bollworm (q.v.), chinch-bug, cut-worms and certain caterpillars which bore in the stalks. In the Central and Southern States, notably in Kentucky and in southern Illinois, the cotton-boll worm in certain years has attacked the corn in the ear, eating the silk and afterward devouring the terminal kernels, hiding within the husk. Whole fields have thus suffered in these States, where there are two broods of the worm, the early and also the late corn faring the worst.

Cut-worms.—These caterpillars are the most insidious pests in fields when the young corn begins to sprout. One species out of many is called the corn cut-worm. It is the young of the Clandestine moth (*Noctua clandestina*). While the fully grown caterpillar has not been described, the young are more or less distinctly marked above with pale and dark stripes, and are uniformly paler below. When first hatched they feed on the corn, descending, when half-grown, into the ground on the approach of severe frosts, and reappearing in the spring, and then beginning to grow again, attaining their full size and pupating before the middle of July, often much earlier, so that in the New England States the moth is seen from the middle of June to the middle or end of August, during which time it lays its eggs. Remedies: before planting, the seed corn should be soaked in copperas water, and late in the autumn corn land should be plowed deeply, so as to turn up the half-grown worms, and expose them to the winter cold and to the attacks of insect-eating birds. Cut-worms may be trapped into holes made by a stake in corn-hills. Riley advises dropping between the rows of corn at nightfall bundles of fresh-cut grass or clover, etc., which has been sprinkled with Paris-green or London-purple solution.

The spindle-worm is a caterpillar nearly an inch long, smooth and naked, with the head and last segment of the body black. It bores into the stalk before the corn spindles and makes the leaves wither. The ravages of this worm begin while the cornstalk is young and before the spindle rises much above the tuft of leaves containing it. On examination a small hole may be seen in the side of the leafy stalk, near the ground, penetrating into the soft centre of the stalk. The obvious remedy is to cut open the stalk, and on finding the worm to pull up all the infested plants. The worms turn into an owlet-moth (*Achatodes zeæ*).

The stalk-borer is a caterpillar of a pale livid hue, with light stripes along the body; it sometimes bores into the cob of growing corn. It occurs in the central and western States in June and July, the moth (*Gortyna nitela*) flying late in August and early in September. The young worm hatches about the first of July and immediately begins to bore into the stalk, but is not noticed till the plant is destroyed. It may be detected on a close examination about the first of July, its hole being at quite a distance from the ground.

The corn-weevil (*Sphenophorus zeæ*) punctures large holes in young corn near the base of the stalk before it has spindled, and sometimes destroys whole fields of young corn. This weevil has been destructive in Tioga County, N. Y. It pierces the young corn in numerous places, so that each blade has from one to eight holes, the size of a pin or larger; when very numerous every stalk is killed. The weevils occur about an inch under ground, hanging to the young stalks with much tenacity. This weevil (q.v.) or snout-beetle is a rather large insect, its body long, narrow, nearly cylindrical, black, with coarse gray dots or punctures; its beak is nearly a third as long as the body, curved down, the tip triangular.

The corn-maggot is the larva of a fly (*Anthomyia zeæ*) which gnaws seed corn after it is planted; the maggot is like the onion-maggot, a footless, white, cylindrical worm, the head ending in two black hooks, the jaws. This insect sometimes so abounds as nearly to ruin entire fields of corn, gnawing into the seed and causing it to rot. When fully fed and ready to transform it contracts, forming a barrel-shaped brown pupa-case within which lies the pupa or chrysalis; the fly, similar to the house-fly, but smaller, appears a week after. The seed should be soaked, before planting, in gas-tar or copperas water.

Wire-worms, the larvæ or slender hard-skinned grubs of snapping-beetles (*Elates*) often ruin to a lamentable degree the roots of corn. They are hard to eradicate, but may be caught by placing slices of potato, turnip or apple in the beds and examining the undersides every morning. Another insect destructive to corn is the chinch-bug (q.v.) which punctures the leaves, sucking the sap. It appears early in June, and there is a summer and winter brood, the adults hibernating in the stubble. (See WHEAT-INSECT PESTS). Several caterpillars live at the expense of corn, among them being the larva of the *io* moth, a great green worm, with poisonous spines, also the fuzzy larva of a moth (*Arctia arge*). Other pests are the larvæ of many beetles, the corn root-worm, which is the larva of a beetle, and is only serious in land which has been planted in corn for several years, and the root-louse, an aphid.

CORN LAWS, regulations of the grain-trade and breadstuffs, a former system of legislation in England, part of the general economic policy of the country, laying duties on importations of various kinds of grain; affecting the internal corn trade and speculative dealings; the assize of bread; the export of corn; the conflict between arable and pasture land; and the dangers of rural depopulation. The system of corn laws thus covered a much wider field than is indicated by import duties, these being but part of a much wider system dealing with allied questions of more importance, and which under changing circumstances are of recurrent interest. The corn laws originated in the reign of Edward III, and ended only with the repeal of the import duties in 1846, their repeal being only part of a great movement in the direction of free trade. As affecting the interests of the consumer, the earliest corn laws were intended to prevent the exaction of monopoly prices and to check speculation. Export of corn was regulated to secure cheapness and plenty at home; the bounty was defended on the same ground; the duties on imports were remitted or released in dear years, and sometimes bounties were given on imports. Up to 1815 the corn laws had little effect on prices, but after that year they raised to some extent the average price, and increased fluctuations beyond what would otherwise have been the case. The producers interested in the corn laws were the landowners, the farmers and the laborers. In the Tudor period direct legislation was attempted to restrict sheep farming and to promote corn-growing. From the 17th century the belief was general that the best sign of national progress was a rise in rent, and it was supposed that anything that raised rent increased progress. These views were held by unbiased, impartial writers. Corn laws that raised rents were also supposed to benefit the nation. At the close of the 18th century the interests of landlords and consumers began to be opposed and the divergence increased till the repeal. The farmers suffered from the greater fluctuations, but there was great progress in agriculture owing to other causes. Wages were low, and especially during the Napoleonic wars, while rents rose greatly, real wages fell. The low wages can only be partly ascribed to the effect of the corn laws. Studied from the point of view of the interests of the state and of general public policy, the early corn laws involved the same idea as the usury laws. The governmental power in regulating foreign trade in corn gave rise to constitutional struggle. Exports were encouraged to promote the mercantile marine and in that way naval power. The revenue from the import duties was considered of secondary importance till just before the repeal. Stress was laid on the advantages of a large rural population and of national independence as regards food supplies. The duties were essentially protective and must be regarded as part of a wider system. The repeal was only part of the general movement toward greater freedom of trade, which began with the petition of the merchants in 1820, and was not completed till 1860. Preferences were granted by the British colonies, also as part of the general policy. At the time of the repeal there was much exaggeration as to the past effects of the corn laws on prices, and also as regards the monopolistic spirit of the landowners. Although the landowners had been the dominant political class for centuries, the greater part of the corn laws had been designed in the interest of the nation as understood at the time. In the 19th century the only part of the system that remained effective was the protective import duties; they had become hurtful to the consumer and trade in general, and if retained would have done still more harm. The whole history of the corn laws is a good example of the negative argument for free trade. Protection to agriculture could only be restored by reverting to old ideas which would now be still more difficult of accomplishment, as conditions have become so much more complex. The best means of securing a sufficient and steady supply of breadstuffs has always been a subject of great diversity of opinion, and the practice of governments has varied much at different times. The theory urged by Adam Smith, and now adopted in Great Britain and generally followed in the United States, is that the government should do absolutely nothing in the matter, on the ground that farmers and merchants, if unchecked, will always form correct views of their own interest, and that their interest will coincide with that of the community. This theory is supported by a large view of the facts. In ancient times famines were much more frequent than they are now, because commerce was more restricted, less regular and extensive, and subject to more frequent obstructions. A free communication between different countries, by which the abundance of the one may be brought to supply the want of the other, has proved the best security against the want of necessaries and even of comforts and luxuries.

The Athenians had laws prohibiting the exportation of corn and requiring merchants who loaded their vessels with it in foreign ports to bring their cargoes to Athens. The public provision and distribution of corn was an important branch of administration at Rome, and very intimately connected with the public tranquillity. The regulation of the supply of corn and the trade in the article have been a fruitful subject of legislation in modern Europe. But it is to be observed that the public solicitude and current of legislation take this direction only in populous countries, or at least those in which the population presses hard upon the means of domestic production of breadstuffs; for countries of which the staple export is corn need to take no measures for securing a supply. In agricultural countries the object of solicitude is to supply the want of arts and manufactures, as in populous and highly improved countries it is to supply the want of food.

But the laws directed to this object have been very various, and some of them contradictory; for as in Athens so in England, at one period the laws prohibited the exportation of corn; whereas at another period, and for a very long one in the latter country, a bounty was given on the exportation; and both these laws had the same object, namely, the adequate and steady supply of the article. (See CORNER; FREE TRADE). Consult Nicholson, J. S., 'History of the English Corn Laws' (London 1904); McCarthy, 'The Epoch of Reform — 1830-50' (London 1882); Platt, 'History of the British Corn Laws' (London 1845); 'British Statutes' (16 vols., London 1882-1900); Hensard, 'Parliamentary Debates' (London 1815-46).

CORN-SALAD, called also lamb's lettuce, a genus of the valerian family (*Valerianaceæ*). There are about 50 species natives of the northern hemisphere, most abundant in the Mediterranean region. Between 10 and 15 species occur in the western parts of the United States, some of which are natives. The plant is an humble annual weed, which is used as a spring salad, especially in France and Germany. The commonest species is *V. olitoria,* which is naturalized in the United States, and often called fetticus, white pot-herb and milk-grass. It is found in waste places and moist ground from April to July. Corn-salad is cultivated in much the same way as spinach, and is much used for the same purpose as ergot (q.v.).

CORN-SMUT, a hemibasidial parasitic fungus (*Ustilago zeæ*), affecting the corn. It causes extensive malformation of the ears, but rarely injures any large part of the crop. As an agricultural scourge corn smut has an unsavory reputation. In medicine it has been used for much the same purpose as ergot (q.v.), but its physiological action is very slight.

CORN SNAKE, a handsome colubrine serpent (*Coluber guttatus*) of the Southern States, also called red chicken snake, scarlet racer, house-snake and mouse snake. It is a near ally of the blacksnakes (q.v.) and has in general the size, habits and temperament of those vigorous reptiles. Its ground color is pale red. "On the back is a series of large crimson saddles narrowly bordered with black . . . On each side of the body is a smaller series of similar blotches, and beneath this a yet smaller series." The abdomen is white with large black squares and the lips are whitish. Although it climbs trees in search of young birds, catches ground birds and sometimes raids the poultry-yard, it feeds chiefly on small rodents and takes its name from being so frequently seen in cornfields, where mice gather to feed on the grain. On the whole, therefore, it is beneficial and ought not to be killed except when it persistently threatens the farmer's chickens. Consult Ditmars, 'The Reptile Book' (New York 1907).

CORNACEÆ, kôr-nā'sē-ē, the dogwood family, a family of plants allied to the Umbelliferæ (q.v.), and containing about 16 genera and 85 species, chiefly natives of the north temperate zone. Some species produced edible fruits;

some are valuable for the medicinal virtues of their bark, and others are cultivated as ornamental plants. See Dogwood; Tupelo.

CORNARO, kōr-nä'rō, **Ludovico,** Venetian nobleman: b. 1467; d. Padua 1566. From the 25th to the 40th year of his age he was afflicted with a disordered stomach, with the gout and with slow fevers, till at length he gave up the use of medicine and accustomed himself to extreme frugality in his diet. The beneficial effects of this he relates in his book entitled ‹Discorsi della vita sobria› (‹The Advantages of a Temperate Life›) (1558, the English translation of which has passed through over 30 editions). Cornaro's precepts are not applicable in their full extent to every constitution; but his general rules will always be correct. His diseases vanished and gave place to a vigorous health and tranquillity of spirits, to which he had hitherto been an entire stranger. He wrote three additional treatises on the same subject. In his work upon the ‹Birth and Death of Man,› composed a few years before his death, he says of himself, «I am now as healthy as any person of 25 years of age. I write daily seven or eight hours, and the rest of the time I occupy in walking, conversing and occasionally in attending concerts. I am happy and relish everything that I eat. My imagination is lively, my memory tenacious; my judgment good, and what is most remarkable in a person of my advanced age, my voice is strong and harmonious.»

CORNBURY, Edward Hyde, Lord, 3d Earl of Clarendon, English colonial governor; b. 1661; d. London, 1 April 1723. He was the son of the 2d Earl of Clarendon and sat in Parliament for Wiltshire from 1685 to 1695 and for Christchurch from 1695 to 1701. He was one of the first officers of his household troops to desert from the service of King James II to the Prince of Orange in 1688. In return he was made governor of New York, where he arrived 3 May 1702. He was confirmed in his office by Queen Anne, and in the same year was also made first royal governor of New Jersey. His rapaciousness, bigotry, incapacity for administration and dissolute habits made him very unpopular. In New York the people became exasperated by his fraudulent appropriation of public funds and his attempts to control the legislature. The legislatures of both colonies finally passed lists of grievances which resulted in Cornbury's removal from office in 1708. He was at once thrown into prison in New York by his creditors and remained there until he became Earl of Clarendon in 1709, when he was enabled to pay his debts and return to England. He was made a privy councillor in 1711 and envoy to Holland in 1714. In Smith's ‹History of the Late Province of New York› (New York 1830) he is spoken of as follows: «We never had a governor so universally detested, nor one who so richly deserves the public abhorrence.» Consult Wilson, ‹Memorial History of New York› (New York 1893) and Gordon, ‹History of New Jersey› (Trenton 1834).

CORNCRACKER STATE, a nickname of Kentucky, whose people are often called «Corncrackers.»

CORNEA (Lat. «horny,» «hornlike»), the transparent concavo-convex disc which forms the anterior fifth of the globe of the eye, fitted accurately into the sclerotic or fibrous coat forming the posterior four-fifths of the organ. It is a segment of a smaller sphere than the sclerotic, and is from seven to seven and a half lines in diameter; the greatest diameter being the transverse. Its anterior convex surface is covered by a continuation of the conjunctival epithelium, and its posterior concave surface is lined also with delicate pavement epithelium, which is in contact with the aqueous humor, and supposed by some to be concerned in the secretion of this fluid. The degree of convexity varies, being usually greatest in children and near-sighted persons. Its circumference is described as fitting into the sclerotic like a watch crystal into its frame. Its principal thickness, which is nearly the same at all points, is made up of about 60 layers of soft indistinct fibres, continuous with and similar to those of the sclerotic, connected together by delicate areolar tissue; these may be separated by maceration. Behind the cornea proper is an elastic transparent lamina called the membrane of Demours, which serves to maintain the corneal curvature. No vessels have been traced beyond the very edge of the cornea, which receives its nutriment in the form of lymph. A superficial and a deep series of vessels surround the cornea, anastomosing freely around its margin; the superficial vessels are continuous with those of the conjunctiva, and the deep with the short ciliary arteries. In diseased conditions both sets of vessels may be prolonged into its substance. No nerves have been traced into the cornea. Its diseases are many, frequent and dangerous to vision; from its exposed situation, it is liable to suffer from blows, cuts and the introduction of foreign substances. It is often inflamed in various ophthalmic diseases, resulting in opacity, ulceration, increased vascularity, softening and rupture from gangrene; these affections are tedious and difficult to cure, are often painful and generally leave the patient with more or less obstruction of the power of vision, if they do not destroy the eye itself. In old persons, the circumference of the cornea often presents a whitish zone, a line or two wide, the result of the deposition of fat, and not interfering with vision. The convexity of the cornea in aquatic and amphibious animals is slight, and sometimes almost lacking.

CORNEILLE, kōr-nā-yė, **Pierre,** French dramatist: b. Rouen, 6 June 1606; d. Paris, 1 Oct. 1684. He began his dramatic career with comedy. His first piece was ‹Mélite,› played in 1629. It was followed from 1632 to 1636 by ‹Clitandre›; ‹La Veuve›; ‹La Galerie du Palais›; ‹La Suivante›; ‹La Place Royale›; ‹L'Illusion Comique,› which had great success. Being more natural and more vigorous in style than the dramas which then held the stage, they announced the approach of a reformer endowed with talents of a higher order, and as such he was recognized even by his rivals. His ‹Medea,› produced in 1635, and imitated from Seneca, was the first indication of his talent for tragedy. His next work was ‹Le Cid,› which raised his fame at one bound to its highest pinnacle. It has been translated into numerous languages, but scarcely bears out its reputation. The popularity of the play was unbounded. But its enemies were stimulated by the hatred of Cardinal Richelieu for its author. Corneille had been appointed as one of five authors to whom Richelieu entrusted the writing out of plays from plots furnished by himself, but he had been guilty of condemning the plot of a comedy committed to him, and the offense was unpardonable. Richelieu stimulated Chapelain to write a critique on behalf of the Academy. The critique was moderate, and while condemning the plot, admitted freely the merits of the author. It is printed in some editions of Corneille's works under the title, ‘Sentiments de l'Academie Française sur la Tragi-Comédie du Cid.’

Among other accusations brought against Corneille was want of originality. This led to his selecting as his next subject Horace (not the poet, but the Horatius of early Roman history), which is perhaps the work in which he shows the greatest invention, and is one of the most admired of his productions. It appeared in 1639; the same year appeared ‘Cinna,’ which, according to Voltaire, was the *chef-d'œuvre* of Corneille; and in 1640 the ‘Polyeucte,’ which other critics have styled the most original, the most touching and the most sublime work of the author, the *chef-d'œuvre* at once of Christian tragedy and of the French theatre. There is one flaw in this work which its admirers do not seem to have noticed. The poet so far mistakes the spirit of the Christian religion as to make Polyeucte, a convert under the Roman Empire, bringing martyrdom upon himself by rushing in to interrupt the Pagan sacrifices and overthrow the altar on which the priest is sacrificing. ‘Pompée,’ an inferior piece, appeared in 1641, and in 1642 ‘Le Menteur,’ the greatest of Corneille's comedies, imitated, like the ‘Cid,’ from the Spanish. Foote has produced an English version of it called ‘The Liar.’

From this time the success of Corneille as a dramatist steadily declined and many of his numerous works, in spite of the fame of their author, never acquired celebrity. On the merits of others the utmost diversity of opinion has prevailed, the same work being the subject of extravagant eulogy and unqualified condemnation. ‘Rodogune,’ ‘Heraclius,’ ‘Don Sanche’ and ‘Nicomède’ are among the best works of his second period, 1646–52. ‘Rodogune’ was his own favorite production. Some critics speak highly of it; others condemn it as showing marked indications of decline. From 1653–59 he gave up writing for the stage and employed himself with preparing a poetical translation of the ‘De Imitatione Christi.’ In the latter year he was induced to return to the drama and persevered 15 years amid declining success in producing pieces generally inferior to his earlier works. ‘Œdipe’ (1659) and ‘Sertorius’ (1662) are the best works of this period. ‘Tite et Bérénice’ (1670) was a rival production to the Bérénice' of Racine, the subject being prescribed to both poets by the Princess Henriette; but Racine's poem was a success, that of Corneille a failure. His last pieces, ‘Pulchérie’ (1672), ‘Suréna’ (1674), were the weakest as well as the last. He had been chosen a member of the Academie Française in 1647, and was dean of the Academie when he died in 1684. Besides his dramas he wrote some minor poetry, elegies, sonnets, epistles, etc., under the title of ‘Poésies Diverses,’ and also in prose three discourses, ‘Sur le Poème dramatique’; ‘Sur la tragédie’; and ‘Sur les trois unités.’ Voltaire has remarked that Corneille was the first dramatist who made the sentiment of admiration the basis of tragedy instead of terror or pity.

The admirers of Corneille gave him the strongest praise for the quality, sublimity. This is a quality not easily defined, and in straining after it it is only too easy to fall into faults very much opposed to sublimity. The faults found with Corneille in his weaker productions are precisely such as might be produced by such an effort, declamation, inflatation, abuses of sentences and great words. His versification is less accurate and polished than that of Racine, as when he began to write the language was less formed, and his own taste in this respect probably less fastidious. There may also be observed in Corneille's delineation of character a straining after a heroic ideal, rather than a true and profound analysis of the real springs of human sentiment and emotion, in which alone an inexhaustible fund of dramatic action is to be found. He was, like Racine, strongly impressed with religious convictions, and extremely scrupulous in his writings. He had a high idea of his own powers, but was deficient in social tact and in conversational ability to such an extent that it is said he did not always express himself grammatically. When reproached for his carelessness in cultivating the graces of society, he would reply, “Je suis toujours Pierre Corneille.” The best edition of Corneille is that by Marty-Laveaux (12 vols., 1862–68). Consult Le Verdier and Pelay, ‘Additions à la bibliographie Cornélienne’ (1908); Picot, ‘Bibliographie Cornélienne’ (Paris 1865). Consult also Brunetière, ‘Epoques du théâtre français’ (ib. 1892); Faguet, ‘Propos de Théâtre’ (3 vols., Paris 1906); Guizot, ‘Corneille et son temps’ (7th ed., ib. 1880); Huszar, ‘Pierre Corneille et le théâtre espagnol’ (ib. 1903); Canfield, ‘Corneille and Racine in England’ (New York 1904); Lanson, ‘Corneille’ (Paris 1898); Lemaître, ‘Corneille et la poétique d'Aristote’ (ib. 1888); Raab, ‘Pierre Corneille in deutschen Uebersetzungen’ (Heidelberg 1911); Wendt, ‘Pierre Corneille und Jean Rotrou’ (Leipzig 1911).

CORNEILLE, Thomas, French dramatist, brother of the preceding: b. Rouen, 20 Aug. 1625; d. Andelys, 8 Dec. 1709. He lived in the most friendly union with his brother till the death of the latter. They had married two sisters, lived in the same house without any division of means, and were remarkable for the conformity of their tastes. His first comedy, ‘Les engagements du hasard,’ appeared in 1647 and was successful. The number of his dramatic works is 42; yet most of them are now little known. His comedies, however, at the time of their appearance were received with greater interest, if possible, than those of the great Corneille, in imitation of whom Thomas applied himself to tragedy; and his ‘Timocrate’ (1656) was received with such continual applause that the actors, weary of repeating it, entreated the audience, from the stage, to permit the representation of something else, otherwise they should forget all their other pieces. Since that time it has not been brought upon the boards at all. ‘Camma,’ in 1661, produced an equal sensation. The spectators thronged in such numbers to witness the representation that scarcely room enough was left for the performers. His best tragedy is ‘Ariane’ (1672). ‘Le Comte d'Essex’ (1678) has also retained some celebrity, although marred by the ignorance it displays of English manners and history. ‘L'Inconnu,’ a heroic comedy, appeared in 1675. In 1677 he versified ‘Le Festin de Pierre’ at the request of the widow of Molière, and until recently, when the prose of Molière superseded it, it was always represented in his version. He was a dramatist of the second rank, laborious but wanting in originality, yet not without considerable resources. In 1685 he succeeded his brother in the French Academy by a unanimous vote. His ‘Works’ were edited by Thierry (Paris 1881). Consult Reynier, ‘Thomas Corneille, sa vie et son théâtre’ (Paris 1893) and Alfred de Vigny, ‘Fragments inédits de critique sur Pierre et Thomas Corneille’ (1905).

CORNEL (Lat. *cornu*, horn, from the hard, horn-like wood), a shrub belonging to the genus *Cornus*, about 20 distinct species, native of north latitude, temperate climate. Flowers generally small, four parted, ovary inferior, and two- or three-celled; fruit fleshy and edible in some species, especially those in Europe. The so-called «flowers» are really clusters of flowers surrounded by large bracts. The cornelian cherry (*Cornus mas*), of Europe, which is there the only member of the genus known as the cornel, bears small greenish flowers; the fruit is acid and edible. The dogwood of the eastern part of the United States is the *Cornus florida*, a small tree which in May and June is covered with large white or pale pink flowers; the wood of which has a fine fibre and is very hard. The bark is sometimes used as a tonic. *C. canadensis*, the dwarf cornel or bunchberry, of woods in the northern part of the United States, is a low herb which bears a close cluster of flowers that ripen into red, fleshy but scarcely edible berries. In North America there are about 18 well-known species. See DOGWOOD.

CORNELIA, Roman matron, the daughter of Scipio Africanus the elder. She married Tiberius Sempronius Gracchus, censor 169 B.C., by whom she was the mother of the two tribunes, Tiberius and Caius. Left a widow with a young family of 12 children, she devoted herself entirely to their education. Only three of her family survived their childhood, her daughter, married to Scipio Africanus the younger, and her two sons. Cornelia was highly educated and united the severe virtues of the old Roman matron with the refinement which then began to prevail in the upper class society of Rome. She bore the death of her sons with magnanimity, and afterward retired to Misenum, where she spent the remainder of her life. She exercised unbounded hospitality, and was constantly surrounded by men of letters. The Roman people erected a statue to her with the inscription: «Cornelia, Mother of the Gracchi,» the base of which, with the inscription, is now in the Capitoline Museum at Rome.

CORNELIAN, or **CARNELIAN** (Fr. *cornaline*, from Lat. *cornu*, «horn»), a precious stone varying from a light and fleshy red, opaque and semi-transparent, with and without veins, to a brilliant transparency and color approaching the ruby, from which they are, however, known by sure distinctive marks. It consists of silica along with minute quantities of the oxides of iron, aluminum, and sometimes of other metals, and is actually a variety of chalcedony. It is much used for seals, bracelets, necklaces and other articles of minute gem sculpture; appended to watches, ornaments now in little use. It was known to the Romans, as we learn from Pliny, by the name of *sarda*, from being found originally in Sardinia. The number of the cornelians that were engraved by the ancients and have reached our times is very considerable and nearly equal to that of all the other kinds of gems with which we are acquainted. Pliny thinks they were clarified by being steeped in the honey of Corsica. The national collection at Paris and the British Museum of London have many beautiful engraved cornelians. Many of the latter were found in the field of Cannæ in Apulia, where Hannibal defeated the Romans.

CORNELIS, kŏr-nā'lis, **Cornelius**, Dutch painter: b. Haarlem 1562; d. 1638. He studied with Peter Ærtsens the younger, and afterward worked at Antwerp under Peter Porbus and Giles Conguet. In 1583 he returned to Haarlem, where his great painting — the ‘Company of Arquebusiers’ — established his reputation. Deschamps called it a collection of figures sketched by the «Genius of History.» It is thought that Franz Hals was strongly influenced by this picture. In 1595, with Charles van Mander, he instituted an academy for painting at Haarlem. His numerous pictures are rarely to be bought, on account of the great value which the Flemings set upon them. Cornelis painted great and small pieces, historical subjects, portraits, flowers and especially subjects from ancient mythology. His drawing is admirable. He is a true imitator of nature, and his coloring is always lively and agreeable, although those done in the Italian style are full of mannerisms and affectations. In his two large, paintings of the ‘Massacre of the Innocents’ in Amsterdam and The Hague, he displays great skill in foreshortening. Consult Wedekind, ‘Cornelis Cornelisz van Haarlem’ (Leipzig 1911).

CORNELIUS, a centurion of the Italic cohort, whose conversion at Cæsarea is related in Acts x. His name would indicate that he was either a member of the distinguished *gens Cornelia*, or a descendant of one of its freedmen. He is reckoned by Julian the Apostate as one of the few persons of distinction who embraced Christianity. The cohort in which he was centurion was probably *Cohors II Italica civium Romanorum*, which a recently discovered inscription proves to have been stationed in Syria before 69 A.D. The description of Cornelius as «a religious man, and fearing God . . .» would indicate that he was one of the «proselytes of the gate» who worshipped the one true God and observed in great part the Mosaic law, but who were not formally affiliated to the Jews by circumcision. That he was not a full proselyte is attested by the opposition that developed to his admission to the Christian Church. His baptism is an important event in Christian history as he was the first uncircumcised Gentile admitted to the new Church without the obligation of submitting to the ceremonial laws of the Jews. Disapproval of his admission by the Jewish Christians of Jerusalem is narrated in Acts xi, 2, 3, and the cessation of that opposition through the influence of Peter in xi, 4-18, the matter being finally settled at the Council of Jerusalem (Acts xv). Consult Baronius, 'Annales,' ad ann. 41, n. 2; 'Acta Sanctorum, Feb' (I, 279 et seq.); Ramsey, 'Cornelius and the Italic Cohort' (in *The Expositor,* 1896).

CORNELIUS, Pope and martyr. He succeeded Fabian on 4 June 251 and according to the Liberian catalogue resigned after 2 years, 3 months and 10 days. Fabian, his predecessor, had suffered martyrdom in the persecution of Decius in January 250. By March of the following year rivals had appeared against the emperor and his absence from Rome caused the persecution to slacken; 16 bishops assembled in Rome and Cornelius was elected. A few weeks later the Roman priest, Novatian, made himself anti-pope, being more acceptable to those who opposed Cornelius because of the latter's leniency toward the *lapsi.* In October 251 Cornelius convened a numerous council at Rome, which confirmed his election. He did not enjoy his honor long, for he was banished by Gallus to Centumcellæ (Cività Vecchia), where he died, or, according to some accounts, suffered martyrdom, 14 Sept. 253. Ten of Saint Cyprian's letters are directed to Cornelius and there are extant two genuine letters of Cornelius to Saint Cyprian. Besides these Cornelius wrote a long letter to Fabian concerning the character and conduct of Novatian, considerable extracts from which are preserved in Eusebius, 'Historia Ecclesiastica.' Consult Benson, 'Cyprian' (London 1897); Mercati, 'D'alcuni nuovi sussidi per la critica del testo di S. Cipriano' (Rome 1899), and 'Acta Sanctorum' for 14 September.

CORNELIUS, kôr-nā'lē-oos, **Karl Sebastian,** German physicist: b. Ronshausen, Lower Hesse, 1819; d. 1896. He studied at Göttingen and at Marburg, giving special attention to the exact sciences. After 1851 and until his death he was professor of physics and physiography at Halle. He published 'Die Lehre von der Elektricität und dem Magnetismus' (1855); 'Theorie des Sehens und räumlichen Vorstellens vom physikalischen, physiologischen, und psychologischen Standpunkte aus betrachtet' (1861); 'Meteorologie' (1864); 'Ueber die Bedeutung des Kausalprinzips in der Naturwissenschaft' (1867); 'Ueber die Entstehung der Welt' (1870); 'Ueber die Wechselwirkung zwischen Leib und Seele' (1880); 'Grundriss der physikalischen Geographie' (6th ed., 1886); 'Abhandlungen zur Naturwissenschaft und Psychologie' (1887).

CORNELIUS, Peter, German composer: b. Mayence, 24 Dec. 1824; d. 26 Oct. 1874. He studied for the stage but meeting with little success, devoted himself to music. He was intimate with Liszt who brought out his opera, 'The Barber of Bagdad,' at Weimar in 1858. Cornelius removed to Vienna and there wrote his second opera, 'The Cid,' which was produced at Weimar in 1865. He became a great admirer of Wagner, and was for a time a professor at the Munich Königliche Musikschule. He began the opera 'Gunlöd' in 1869, and it was finished from sketches after his death by his pupil, C. Hoffbauer. 'The Barber of Bagdad' is his masterpiece. It was rescored by Mottl and Levi and produced in Munich in 1885. It had a great success and is to-day in the repertoire of every German opera house. It was produced in New York in 1890. Other works by Cornelius are his 69 songs for one voice and 7 duets. He wrote brilliantly on music and was also a poet of distinctive merit. His music is noted for its nobility, power of characterization and tone refinement. His complete works were issued by Breitkopf and Härtel (5 vols., 1905), and his literary works and letters (4 vols., 1905). Consult Istel, E., 'Peter Cornelius' (Leipzig 1904), and Sulger-Gebing, E., 'Peter Cornelius als Mensch und Dichter' (Munich 1908).

CORNELIUS, Peter Von, German painter: b. Düsseldorf, 23 Sept. 1783; d. 7 March 1867. He early exhibited a taste for art, and accustomed himself to copy from memory the works of Raphael and other masters. He thus acquired an early proficiency, and at 19 was entrusted with the painting of the cupola of the church of Neuss, near Düsseldorf. It was executed in chiaroscuro, in figures of colossal size, and showed already the grandeur of conception by which he was afterward distinguished. He soon after removed to Frankfort, where in 1810 he commenced a series of designs illustrative of Goethe's 'Faust.' In 1811 he went to Rome, where, with Overbeck, Veit and other associates, he projected the formation of a new school of German art, and especially the revival of fresco painting, in imitation of Michelangelo and Raphael. Bartholdy, the Prussian consul-general, commissioned some members of this school to paint his villa. Cornelius executed two frescoes for this purpose — 'Joseph Interpreting the Chief Butler's Dream' and 'Joseph Recognizing His Brethren.' He afterward began a series of frescoes from the 'Divina Commedia' for the Marquis Massini, but left it unfinished in consequence of receivin a commission to execute the frescoes in the Glyptothek, then newly erected at Munich. The designs for the villa of Massini, though never painted, were engraved by Schoefer, and another series, illustrative of the 'Niebelungen Lied,' were engraved by Amsler and Lips.

Before leaving Rome (1819) Cornelius had been appointed director of the Academy at Düsseldorf. His first work was to reorganize the Academy, and then to give his whole attention to the painting of the Glyptothek, which demanded a constant residence at Munich. He resigned the directorship after a short time, and received in 1825 that of the Academy of Munich. Simultaneously with the Glyptothek he undertook the painting with frescoes of the Ludwigs-Kirche. In these two great works he was assisted by his Munich pupils. Many of the cartoons prepared by him were painted under his superintendence by Zimmermann, Schotthauer and others. In the Glyptothek two large halls were entrusted to him to decorate. In the one, called the Hall of Heroes, he gave a representation on a colossal scale of the leading events of the Iliad; in the other, named the Hall of the Gods, he symbolized the Grecian mythology. In the Ludwigs-Kirche the greatest painting in size and importance was the 'Last Judgment,' of which one critic says that it is without a rival among contemporary paintings, another that it is enough to say of it that in it Michelangelo is both imitated and disregarded. Cornelius also painted at Munich the Pinakothek, a picture gallery for which, with the assistance of his pupils, he executed an extensive series of frescoes representing the history of painting. In 1841 he was invited to Berlin by Frederick William IV, who entrusted him with the painting of the royal mausoleum or Campo Santo. The most celebrated cartoon in this series is the 'Four Riders of the Apocalypse.' The series consists of 12 paintings, which have been engraved. He was admitted a foreign member of the Institute of France in 1838 and a member of the Academy of Berlin in 1841. His advice and assistance were widely sought and he executed or superintended various works besides those enumerated.

On his merits as an artist there are the widest diversities of opinion according to the sympathies of those by whom he is appreciated. Cornelius was a true representative of modern German thought in its highest phases. He introduced into art a metaphysical and subjective element which in the hands of so competent an interpreter could not but be productive of great results, but which is equally open to the severest criticism. That he was the founder of a school and threw new life into German art the mere enumeration of his great undertakings is sufficient to prove. Even his admirers, however, admit certain faults in his execution, and it would seem that in aiming at grandeur he too often failed to be natural. In seeking to develop his leading idea he subordinates details to an extent which amounts to sacrificing them, and that idea is often admittedly recondite, and requires learning and study to appreciate it. Still his admirers insist that his merits are such in the grandeur and beauty of his designs and the elevation of the tone of his execution as to overbear all faults of detail; but there are not wanting detractors who say that his excellences, whatever they may be, do not belong to the region of art, and that it is necessary to go outside of it into that of metaphysics to be able to appreciate them. Consult Dohme, 'Kunst und Künstler des neunzehnten Jahrhunderts' (Leipzig 1883); Eckert, 'Künstlermonographien' (Bielefeld 1906); Grimm, 'Neun Essais' (Berlin 1865); Koch, 'Peter Von Cornelius' (Stuttgart 1905); Von Wolzogen, 'Peter von Cornelius' (Berlin 1867); Riegel, 'Cornelius, der Meister der deutschen Malerei' (ib. 1870); Förster, 'Peter von Cornelius: ein Gedenkenbuch' (1874); Muther, 'History of Modern Painting' (Vol. I, English trans., London 1895).

CORNELIUS NEPOS. See Nepos.

CORNELL, Alonzo Barton, American capitalist and politician: b. Ithaca, N. Y., 22 Jan. 1832; d. 15 Oct. 1904. He was a son of Ezra Cornell (q.v.), and his early life was spent as a telegraph operator and manager in Cleveland and New York. He was defeated as Republican candidate for lieutenant-governor in 1868; was chairman of the New York State Republican Committee 1870–78; surveyor of customs, New York, 1869–73; speaker of the assembly 1873; and naval officer of the port of New York 1876–78. During Cornell's occupancy of the latter office, President Hayes issued his famous order requiring office holders to refrain from politics. In spite of this warning, Mr. Cornell, as chairman of the State committee, called the Rochester convention to order, and as a consequence lost his office, July 1878. In 1879 he was elected governor by the Republicans, and served until 1 Jan. 1883, since which time he devoted himself to the care of his large financial interests. He wrote 'True and Firm: Biography of Ezra Cornell, Founder of the Cornell University: a Filial Tribute' (1884).

CORNELL, Ezra, American capitalist and philanthropist: b. Westchester Landing, N. Y., 11 Jan. 1807; d. Ithaca, N. Y., 9 Dec. 1874. He was of Quaker parentage and in 1819 removed with his father, a potter by trade, to De Ruyter, N. Y. His early education was scanty, and for a time he assisted his father in farming and in making pottery, meanwhile teaching in a district school. He also learned the trade of carpenter, worked as a mechanic at Homer, N. Y., and from 1826 to 1838 was manager of a flour mill at Ithaca. He was afterward engaged in a lumber business with his brother, but in 1842, when telegraph lines were first being put in operation, he became interested in the construction of a telegraph line from Baltimore to Washington. He invented a machine for laying the wires underground and was placed in charge of the work. This method failed, owing to defective insulation, and Cornell's suggestion that the wires should be strung on poles was adopted. He then devoted himself to telegraph line construction and the organization of telegraph companies, and was one of the founders of the Western Union Telegraph Company in 1855. He accumulated a large fortune and in 1858 retired to a farm at Ithaca, N. Y. He was a member of the first Republican National Convention of 1856, was a member of the State assembly in 1862–63, and of the State senate 1864–67. He is best known as the founder of Cornell University, which he liberally endowed and for which he secured special legislation at Albany. He also founded a public library at Ithaca. Consult 'The Life of Ezra Cornell,' by his son, Alonzo Barton Cornell (New York 1884).

CORNELL COLLEGE, a coeducational institution in Mount Vernon, Iowa; organized as a college in 1857, under the auspices of the Methodist Episcopal Church. It includes an academic department and a department of civil engineering. The degrees are B.A., B.S. and B.S. in C.E. The enrolment is about 750 and the faculty numbers 41. Besides the college proper, the organization includes an academy, a conservatory of music, a school of art and a school of oratory. The principal buildings of the college are the library and college, science, chapel, Bowman and conservatory halls. The endowment amounts to about $900,000 and the annual income to about $90,000. The library contains about 39,000 volumes.

CORNELL UNIVERSITY, at Ithaca, N. Y., owes its origin primarily to the Land Grant Act of 1862, «donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts.» Under this act New York received as its portion 989,920 acres of land. The institution established was named in honor of Ezra Cornell (q.v.), who offered to give $500,000 with which to erect its buildings (the terms of the land grant forbidding the use of its proceeds for that particular purpose), on condition that it should be located at Ithaca. The university was incorporated in

1865. The number of students (412) who registered at the opening was highly satisfactory. The liberality of the charter, which guarded against possible control or undue influence by any religious denomination; the nature of the entrance requirements; the promise of opportunities to pursue lines of study not found in other schools then existing; the location, free from the distractions of a large city — these and other features combined to attract students to the new school. Yet, encouraging as was the beginning the university for the next four years had much difficulty in maintaining its existence. The State's land scrip, which was expected to bring not less than $10 an acre, was being sold for only 50 cents an acre, when Ezra Cornell, believing that the land would increase in value, purchased all the scrip, which had not been otherwise disposed of, and bought over 500,000 acres of excellent timber lands in Wisconsin, which before his death he transferred, with full title and control, to the university. But not before 1882 were any of these lands sold for amounts sufficient materially to aid the institution; then the sum of $2,320,000 was realized from the sale of 140,000 acres. Later other lands were sold at fair prices, making in all from the land grant lands a net profit of about $6,000,000.

Besides Ezra Cornell's endowment, the university received large gifts from Henry W. Sage, for a women's dormitory, a chapel, a library building and a book endowment fund, a school of philosophy, a museum of archæology, etc., all generously endowed; a donation from John McGraw for a building devoted to museums and scientific laboratories; from Hiram Sibley for a college of mechanical engineering and mechanic arts; from Andrew D. White a priceless historical library; from Dean Sage a fund for supplying the college pulpit, etc. The university is also indebted to A. S. Barnes for a Christian Association building; to William H. Sage for the chapel enlargement and organ, the purchase of the great Zarncke library, a stone bridge, and in conjunction with Dean Sage, an endowed infirmary for sick students; to Dean Sage for Stimson Hall; to John D. Rockefeller for Rockefeller Hall of Physics; to Willard Fiske for a library fund of about a half million dollars; to Oliver H. Payne for the Cornell Medical College in New York city, and to others for valuable gifts. The total property valuation of Cornell University in 1915 was $22,786,051.73. The total invested funds were $14,051,115.33; total income for 1915, $3,139,530.38, of which $202,632.06 represented benefactions. Grounds, buildings, equipment and other property of the university in 1915 were $8,534,157.48. The library comprises 460,000 volumes. In all 16,698 degrees had been granted and there were about 14,500 living graduates.

The broad scope and many-sidedness of the university are based on Ezra Cornell's proposition, «I would found an institution where any person can find instruction in any subject,» in which the more specific purpose of the national donors was absorbed and included. Since provision was made for women in the early 70's they have formed from 10 to 15 per cent of the student body, though in recent years the number both absolutely and relatively has decreased. The university annually grants free tuition to 600 students of New York State, apportioned by assembly districts; also to New York State students in agriculture, and to New York State students in veterinary medicine.

Cornell University occupies in the United States a middle ground between the institutions of private or chiefly private foundations, with independent corporate existence, and the State universities supported and controlled by the States. The government of the State of New York is represented in Cornell University by ex officio members on the board of trustees. Its constitution has undergone many changes, as well of internal arrangement as of outward expansion. Its present organization is as follows: 1. Graduate department. 2. College of Arts and Sciences. 3. College of Law. 4. College of Medicine. 5. New York State Veterinary College. 6. College of Agriculture. 7. College of Architecture. 8. College of Civil Engineering. 9. Sibley College of Mechanical Engineering and Mechanic Arts.

The graduate department has charge of the graduate studies of the other departments. Courses leading to the degrees of A.M. and Ph.D. are pursued in this department; and 16 graduate scholarships of the value of $200 and free tuition each, 23 fellowships of $400 and free tuition each, and 2 of $500 and free tuition each are annually granted to graduate students, besides one traveling fellowship in architecture of the annual value of $1,000, good for two years. The College of Arts and Sciences allows elective courses in science and the classics and leads to the A.B. degree B. Chem. The College of Law has the usual law courses and grants the degree of LL.B. The College of Civil Engineering provides instruction in all departments of that subject, and particularly in some of the more advanced developments of the science. Special instruction is given in bridge engineering, railroad engineering, sanitary, municipal, hydraulic and geodetic engineering.

The Sibley College includes eight departments: mechanical engineering, experimental engineering, electrical engineering, machine design, mechanic arts or shop-work, marine engineering, naval architecture and railway mechanical engineering. Courses of study are four years in length, and the degree of mechanical engineer is conferred upon those who successfully complete the respective courses. The laboratories, museums, shops and other parts of the college are very completely furnished and equipped. Hiram Sibley continued making additions to his first donations, and in 1885 the trustees of the university organized the college under the name by which it is now known. Mr. Sibley's gifts amounted to $160,000, and $150,000 additional have been contributed by his son, Hiram W. Sibley. The College of Architecture gives the usual course in this subject, both in theory and practice and confers the degree of B.Arch. The College of Agriculture gives extended and practical courses. An experiment station established by the Federal government is connected with this department. In 1904 the New York State legislature established a State College of Agriculture at Cornell, and appropriated $250,000 for buildings therefor. The College of Medicine (established in 1898) has a two years' course in Ithaca, and a full four-year course in New York.

The entrance requirements to all courses are

1 College of Agriculture

2 Residential Halls

substantially the same as those of other first-class universities. In 1914 the total number of students in attendance was 5,094, and of this number the College of Arts and Sciences had about 1,223 and Sibley 887. There were 700 members of the faculty, some of whom were engaged in university extension work. The summer school has always had a large attendance. See SUMMER SCHOOLS.

The campus is admired for its beauty and extent, and the group of buildings which belong to the university are models of architecture. The library, with its famous Fisk Dante collection and the Andrew D. White French Revolution collection; the laboratories, halls and dormitories; the classrooms, and other features of the university all present special advantages and attractions.

CORNER, a commercial term used in England and the United States to signify the control of so large a supply of an industrial or commercial product or of so much of a stock that the market value of the commodity held is tremendously advanced, and those who have made contracts to deliver the stock or commodity in question must buy at the prices set by the pool. So the actual difference between the manœuvre of the corner-man and the normal effort to bull prices by controlling supply is that the corner is based upon knowledge of contracts made for future delivery by those who are not in present possession of the stock. In stock exchange parlance a «corner» is procured where somebody succeeds in buying for further delivery more property of a given kind than is possible for the seller to deliver before the day of the maturity of the contract. The term is used in boards of trade, etc., to designate the condition arising when a much greater quantity of any given commodity is sold for future delivery within a given period than can be purchased in the market. The buyers, who are called in the slang of the exchange «longs,» then insist on delivery, and by these means succeed in running up prices to a fictitious point, bv which deals are run out between the dealers, or by exchanges, or, where the person insists upon it, by actual delivery. A very large majority of these transactions are no doubt merely speculative, but many of them are actually purchases for manufacturers and exporters. Successful corners depend then not only on a thorough understanding of where the control of the commodity in question lies, lest another holder at the critical moment be able to undersell the would-be corner-man, but on the willingness of the buyer to keep his contracts at no matter what cost. In other words, if the corner-man is too greedy and demands too high a price, buyers may smash the corner by refusing to keep their contracts, a procedure with a certain amount of poetic justice in it, at least when the members of the corner have gained control of the supply which they are to rebuy from the contractors. Legally defined, a «corner» is the securing of such control of the immediate supply of any product as to enable those operating the corner to advance arbitrarily the price of the product. It is created ordinarily by operations on boards of trade or stock exchanges, and by dealings in options and fixtures. A «corner» when accomplished by a confederation to raise or depress prices and operate on the market is a conspiracy if the means employed are unlawful. Cereals and cotton, because of the large amount of future trading done in them, are favorite fields for the corner-man; but the exact amount of a year's crop and the thorough location of such holdings make the manœuvre particularly dangerous. Typical «corners» of ancient history include: Joseph's buying and storing the corn of Egypt, so that «all countries came to Joseph to buy corn» (Gen. xli, 57); and the Athenian corner in grain, orated against by Lysias (d. 380 B.C.). Many of the worst financial panics in the United States have been the results of attempts, usually unsuccessful, to corner the gold market. The greatest of these was that which culminated in Black Friday, 24 Sept. 1869, through the operations of Jay Gould and James Fisk, Jr. Consult Boutwell, G. L., 'The Mint Bill and the Crime of 1873' and 'Black Friday' (Chaps. 34-35 in Vol. 2, 'Reminiscences of Sixty Years in Public Affairs,' New York 1902); and Lysias, 'Against the Grain Dealers'; also of allied interest 'On the Sacred Olive' (orations 22 and 7 in 'Ten Selected Orations' edited by G. P. Bristol, Boston and Chicago 1892).

CORNET (Fr. «little horn»), formerly a reed wind instrument of the oboe class; but the name cornet or *cornet-à-pistons* is now given to a brass musical instrument with a cup-shaped mouthpiece, which has a very agreeable tone, and is much used in orchestras and military bands, and sometimes with organ in church music. The cornet is intermediate in character between the French horn, the trumpet and the bugle. Its characteristic feature is its three pistons, which may be pressed down by the fingers singly or together, so as greatly to increase its compass. The first lowers the pitch by a tone, the second by a semitone, the third by three semitones. Its range is from C^1 to C^3. In brass bands it takes the soprano and contralto parts. The name was also applied to the stop or series of pipes in an organ, intended to imitate the tone of an obsolete wind instrument which has been superseded by the oboe.

From its military use the term cornet was transferred to a cavalry troop, because it was accompanied by a cornet player, and then to the color officer of this troop, the cornet of cavalry corresponding to the infantry ensign. This title of the English army was abolished in 1871, the rank of sub-lieutenant taking its place.

CORNETO, kōr-nā'tō, or **CORNETO TARQUINIA**, Italy, a picturesque, mediæval-looking town, situated 12 miles north of Cività Vecchia, three miles from the Mediterranean, on the Marta River. Corneto is the seat of an episcopal see. It rose out of the ruins of the Etruscan city of Tarquinii, whose remains, within a mile and a half of Corneto, are among the most important for the student of Etruscan history. It seems to have been destroyed by the Saracens. The Necropolis of Tarquinii, the most important relic of the ancient city, is on the same hill as the modern city and extends into the neighboring plain. It covers about 16 square miles. The painted tombs, of which some 20 are specially interesting, were known in the 18th century; but it is mainly since 1842 that they have been examined; valuable new discoveries were made during excavations in 1881-82. Pop. about 7,000. Consult Dennis, 'Cities and Cemeteries of Etruria' (London 1907); Dasti, 'Notizie di Tarquinia e Corneto' (Rome 1878); and the periodical *Notizie degli Scavi* (1906–07).

CORNFLOWER, or BLUEBOTTLE (*Centaurea cyanus*). A plant of the Compositæ family, indigenous to Europe. It develops long slender, branched stems, from 12 to 30 inches high, and with a flower about one and one-half inches in diameter. It is a hardy plant and is popular in American flower gardens. There are many varieties and the color ranges from deep blue to white.

CORNHILL, London, one of the principal streets of the city, once a corn market. In mediæval times two of its attractions were the Tun, a round house used as a temporary prison, and the Standard, a water conduit and also a point of measurement.

CORNICE (It. «cornice»), **LA CORNICHE,** or **CORNICE ROAD,** a famous highway between France and Italy, skirting the Mediterranean from Nice to Genoa. The word cornice means literally «shelf,» in allusion to the fact that for miles the road is cut in the face of the cliffs. The modern road was begun by the French and finished by the Sardinian government after the fall of Napoleon.

CORNICE, in architecture, the uppermost of the three parts of an entablature, composed of the projected moldings of the roof. The Egyptian form was a high cavetto or fillet above a round bend. Three styles are known in Greek architecture: The Doric cornice consists of a Doric cyma, the corona projecting considerably, and containing the ends of the roofing boards, a second cyma and an erect bell molding. The Ionic cornice shows a fillet either with dentals or quite plain, above which are a wave molding and the corona, terminating in a slab and erect bell molding. The Corinthian cornice differs from the Ionic in having small consols, composed of volutes and acanthus leaves. In Gothic architecture the cornices are often elaborately adorned with animals or with human figures. In Romanesque buildings, an arcaded cornice was developed, resting on corbels without arches or moldings. The Renaissance revived the classic type. It is used now as a projection on the top of a wall, which is used to throw off the rain water from the roof.

CORNING, Erastus, American capitalist: b. Norwich, Conn., 14 Dec. 1794; d. Albany, N. Y., 9 April 1872. He became a prominent iron merchant in Albany, N. Y., subsequently engaged in the banking business, and applied much of his time and means to the development of the railroad system of New York State. He effected the consolidation of various roads into the New York Central Railroad, and was its president 12 years; was State senator 1842–45; member of Congress 1857–59 and 1861–63; member of the Peace Congress in 1861, regent of the University of New York in 1833, and vice-chancellor of the board.

CORNING, James Leonard, American physician: b. Stamford, Conn., 26 Aug. 1855. He studied at the universities of Heidelberg and Würzburg in Germany, and was graduated at the latter. He has an international reputation as an expert neurologist, and as the discoverer of spinal anæsthesia (1885). He was the first to inject liquid paraffin into the tissues, there to solidify; he also demonstrated that the action of stimulants, sedatives and certain other medicinal substances may be increased if the subject remains in compressed air. As consulting neurologist he served various New York hospitals and, besides his contributions to the medical press, wrote 'Carotid Compression' (1882); 'Brain Rest' (1883); 'Local Anæsthesia' (1886); 'Hysteria and Epilepsy' (1888); 'Treatise on Headache and Neuralgia' (1888); 'Pain in Its Neuro-Pathological and Neuro-Therapeutic Relations' (1894); 'Experimental Researches Regarding the State of the Mind in Vertigo' (1895). Under the pseudonym of Roland Champion he wrote a romance entitled 'Princess Ahmedee' (1900).

CORNING, Iowa, city and county-seat of Adams County, 75 miles east of Council Bluffs, on the Burlington Route. It has manufactories of brick and tile and extensive interests in agriculture and stock-raising. The chief buildings are the public library and the Masonic Temple. The waterworks are the property of the municipality and the government is vested in a mayor and council. The city was incorporated in 1871. Pop. 1,702.

CORNING, N. Y., city and county-seat of Steuben County. It is situated on the Chemung River, the Erie and the Delaware, Lackawanna and Western railroads. Among the more prominent buildings are the city hall, free academy, public library, Corning Hospital, courthouse, city club and Saint Mary's Orphan Asylum. Corning has extensive manufactures of cut and flint glass, railway supplies, pneumatic drills, air compressors, terra-cotta goods, building and paving brick, lumber, sash and blinds, etc. The United States census of manufactures for 1914 recorded 58 industrial establishments of factory grade in the city, employing 2,482 persons; of whom 2,203 were wage earners, receiving annually $1,473,000 in wages. The capital invested aggregated $4,992,000, and the year's output was valued at $3,954,000; of this, $2,921,000 was the value added by manufacture. Corning was incorporated as a city in 1890. Under the revised charter of 1905 the mayor holds office for two years and the council is elected. The waterworks are owned by the city. Pop. 15,000.

CORNISH, Charles John, English naturalist: b. Salcombe House, Devonshire, 28 Sept. 1858; d. 30 Jan. 1906. He was educated at the Charterhouse and Hertford College, Oxford, and for many years was a regular contributor to *The Spectator* and *Country Life* on natural history and outdoor life. His published books include 'The New Forest' (1894); 'The Isle of Wight' (1895); 'Life at the Zoo' (1895); 'Wild England of To-day' (1895); 'Animals at Work and Play' (1896); 'Nights with an Old Gunner' (1897); 'Animals of To-day' (1899); 'The Naturalist on the Thames' (1902).

CORNISH LITERATURE. The ancient language of Cornwall formed with Welsh and Breton the Cymric or southern division of the Celtic Languages (see CELTIC LANGUAGES; CELTIC LITERATURES) and more closely resembled the Breton than the Welsh. It was generally spoken until the time of Queen Elizabeth.

Its decay dates from the Reformation, and was due to the failure of the Church of England to translate the Book of Common Prayer and the Bible into the language of the province. After 1678 it ceased to be used in public worship. Dolly Pentreath of Mousehole (1676–1771) is reputed to have been the last person to have spoken it wholly; but words and phrases have come down which are still in use. Its vocabulary dates probably from the 13th century; and the sacred dramas that survive are not earlier than the 14th century. Consult Norris, 'Ancient Cornish Drama' (1859); Stokes, 'Mystery of Creation' (1864); 'Glossary of Cormac' (1864); edition of 'Life of Saint Meriasek' (1872); Jago, 'Ancient Language of Cornwall' (1882); 'English-Cornish Dictionary' (1887); Williams, 'Lexicon Cornu-Britannicum' (1865) and supplementary to the last named, Loth's 'Remarques et corrections' (1902); Jenner, 'Handbook of the Cornish Language' (1904).

CORNSTALK, chief of the Shawnee Indians: b. about 1720; d. 1777. He was a man of high abilities and dignity of character. He first appears as heading the Greenbriar massacre of July 1763, in Pontiac's war; next in a far higher rôle, as commanding the Indian forces at the bloody and hard-fought battle of Point Pleasant, 10 Oct. 1774, in Dunmore's war. (See COLONIAL WARS). He had opposed the war, being convinced that it meant ultimately swifter ruin for the Indians; but once embarked, he fought with a skill and resolution that excited the admiration of his enemies. After the defeat he was in favor of carrying on the war to the end; but finding his head men and sub-chiefs determined on giving up, he went himself to make the best terms he could. His oratory was said by the Virginians to equal Patrick Henry's. Early in 1777 he came with his son and two other Indians to the garrison at Point Pleasant, to tell them that, although he wished to keep the peace, his tribe was resolved on war, and if so, he must join them. The party were held as hostages; but one of a company of rangers being killed by Indians near by, the rest and their captain rushed to the fort and butchered the four, Cornstalk rising to meet his fate without a word.

CORNUS. See CORNEL; DOGWOOD; TUPELO.

CORNWALL, Duke of, a hereditary title of the eldest son of the sovereign of Great Britain. Cornwall is a royal duchy, the revenues of which belong to the Prince of Wales for the time being. The title of Prince of Wales is conferred by special creation, that of Duke of Cornwall descends by inheritance. The dukedom of Cornwall was created for the Black Prince in 1337.

CORNWALL, Barry. See PROCTOR, BRYAN WALLOR.

CORNWALL, Henry Bedinger, American chemist: b. Southport, Conn., 29 July 1844. He was graduated at Columbia 1864, and from its school of mines 1867, becoming assistant in the latter 1865–73, save for two years' study at the mining school in Freiberg, Germany. In 1873 he was appointed professor of applied chemistry and mineralogy at Princeton University, and in 1910 became emeritus professor. With Caswell, he translated Plattner's 'Manual of Qualitative and Quantitative Analysis with the Blow-pipe' (1875), and has written 'Manual of Blow-pipe Analysis, with a System of Determinative Mineralogy' (1882), and many scientific papers that have appeared in the special journals of his profession.

CORNWALL, Canada, port of entry, and capital of the three united counties of Stormont, Dundas and Glengarry in Ontario, and is situated at the intersection of the main line of the Grand Trunk Railway with the Ottawa and New York Railway. It has admirable shipping facilities, and is 67 miles west of Montreal, 56 miles from Ottawa and 50 miles from the Adirondacks. It has eight churches, Anglican, Roman Catholic, Presbyterian, Methodist, and one Salvation Army barracks. There are three hospitals, six schools, a commercial college and numerous banks and public buildings. It has large textile industries, paper, pulp, flour and planing mills, machine shops and foundries, and manufactories of pottery and agricultural implements. Building stone is quarried in the neighborhood. The city is in a rich agricultural section and has a large trade. The United States is represented by a consular agent. It has weekly newspapers and is lighted by gas and electricity. Pop. 6,598.

CORNWALL (Lat. *Cornu Galliæ,* "horn of Gaul," that is, the remotest land inhabited by Celts), England, a maritime country, forming the southwestern extremity of the island. Its form is irregularly triangular. Its area is 1,357 square miles. The northwestern coast-line is broken by a number of shallow bays. The south coast is much more broken, and is marked both by bolder promontories and deeper bays. At Land's End, between these two coasts, terminate the hills of the Devonian range. The rivers of Cornwall are numerous but short. Among them are the Fowey, the Camel, the Inny, the Attery, the Lynner, etc. The climate, owing to the elevation and exposure of the surface, is very variable. The soil, consisting of decomposed slate, admits of easy drainage, but requires much manure. In many of the more elevated districts much of the land is almost barren. Nearly 70 per cent of the total area is under cultivation, a large amount of grain being grown, and much land being devoted to market-gardening for London consumption. Cattle, sheep and horses are reared. The mines of copper and tin, famous for many centuries, and known to the Phœnicians, still constitute the richest treasures of the county, though the value of both has greatly diminished. The chief mining district is in the southwest part of the county. Several mines exceed 350 fathoms in depth. In the once productive Botallack copper mine, situated a few miles north of Land's End, the workings are on the very verge of the cliff, and, descending beneath the sea, are carried far beyond low-water mark. The Dolcoath mine, near Camborne, is the chief tin mine, and there are other important tin mines in the same locality. The production of copper has greatly decreased in recent times. China-clay is an important mineral product. Owing to depression in the mining industry, there has been considerable emigration to the silver mines of Nevada, and to other mining centres. There are few manufactures, but the fisheries, particularly of pilchard and mackerel, are valuable. The dukedom of Cornwall is always held by the eldest son of the sovereign, to which valuable estates are attached. At the time of the Roman conquest Cornwall was occupied chiefly by tribes of Cimbri and Damnonii, and became included in the province of Britannia Prima. After the Romans withdrew the natives regained their independence and retained it till the time of Athelstane, when they were subdued by the Saxons. Their Celtic origin is fully established by the abundance of rude monuments spread over the country, and consisting chiefly of unwrought stones placed erect, singly or in circles, with others laid across. It is divided for parliamentary purposes into six divisions, each returning one member. Pop. 328,098. Consult Boase, 'Bibliotheca Cornubiensis' (1874-78).

CORNWALL, or CORNWALL-ON-THE HUDSON, N. Y., village in Orange County on the west shore of the Hudson River, at the foot of Storm King Mountain, 52 miles north of New York by rail. The beauty of the adjacent scenery and the proximity to New York city, which can be reached in less than two hours by the Erie or the West Shore railroads, make it a favorite summer resort. A carpet mill gives employment to a fourth part of the inhabitants. Idlewild Park and Storm King Mountain are among the prominent points of interest. It was settled about 1684, became a precinct in 1764, a township in 1778 and was incorporated in 1885. From the original township have since been taken Highlands, Blooming Grove and Monroe, besides parts of Chester and Hamptonburg. Consult Beach, 'Cornwall' (Newburgh 1873); Eager, 'History of Orange County' (Newburgh 1847). Pop. 3,000.

CORNWALL CANAL. See CANADIAN CANALS.

CORNWALLIS, Caroline Frances, English author: b. Kent, 12 July 1786; d. Lidwells, Kent, 8 Jan. 1858. She acquired a thorough knowledge of Latin and Greek, and making herself conversant with nearly every study which occupies thoughtful men, from an early age, carried on a correspondence with many eminent persons. Her refusal to accept the hand of the Italian historian, Sismondi, did not forfeit his friendship, and she lived much in Italy. Her first work, 'Philosophical Theories and Philosophical Experience, by a Pariah' (1842), was the first of a series of 20 'Small Books on Great Subjects,' the said subjects including the 'Connection of Physiology and Intellectual Science'; 'Ragged Schools'; 'Criminal Law'; 'Greek Philosophy,' and the 'History and Influence of Christian Opinions.' Twenty-two volumes of this series appeared between 1842-54, all the most important of which were written by herself. She also published in 1847 'Pericles, a Tale of Athens,' and her 'Letters and Remains' appeared in 1864.

CORNWALLIS, Charles, 1ST MARQUIS and 2D EARL, English general: b. London, 31 Dec. 1738; d. Ghazipur, Benares, India, 5 Oct. 1805. He was educated at Eton and Cambridge, and entering the army served in 1761 in a campaign of the Seven Years' War as aide-de-camp to the Marquis of Granby. After passing through all the various promotions he obtained the rank of general. He represented the borough of Eye in Parliament from 1760 until the death of his father in 1762, when he succeeded as Earl Cornwallis. In 1770 he was made governor of the Tower. In Parliament he generally supported the ministry, but exercised an independent judgment on several important questions. In particular he was opposed to the policy which brought on the American war; but though offered a special leave of absence from the king sailed with his regiment when it was ordered to America in 1776. He served with distinction under Generals Howe and Clinton in the campaigns of 1776-79 in New York and the Southern States, and in 1780 was left in independent command in South Carolina, with 4,000 men. He defeated General Gates at Camden 16 Aug. 1780, and General Greene at Guilford 15 March 1781. He then invaded Virginia, but after moving his forces according to successive and contrary instructions from Sir Henry Clinton, he was besieged in Yorktown, where he had entrenched himself, and compelled to surrender on 19 Oct. 1781. In 1786 Lord Cornwallis was sent to India with the double appointment of commander-in-chief and governor-general; and not long after the government of Bengal declared war against the Sultan of Mysore for an attack upon the Rajah of Travancore, the ally of the British. The first campaign was indecisive; but in March 1791, he invaded Mysore, captured Bangalore; and in the year after besieged the city of Seringapatam, and obliged the sultan, Tippoo Sahib, to sue for peace, and surrender a large portion of his dominions. On the conclusion of the war Lord Cornwallis returned to Great Britain, and in 1792 was created marquis, appointed master-general of the ordnance, and admitted a member of the privy council. In 1798, at the time of the rebellion, he was appointed lord-lieutenant of Ireland, which office he filled until 1801, conducting himself with great firmness and judgment. In the same year he was sent as plenipotentiary to France, where he signed the Peace of Amiens. In 1804 he was again appointed governor-general of India. Consult Marshall, 'Memoir' (Gateshead 1806); Lord Cornwallis, 'Correspondence' (edited by Ross, London 1859); Seton-Karr, "The Marquess Cornwallis" (in 'Rulers of India,' Oxford 1890).

CORNWALLIS, Edward, English soldier and colonial administrator: b. 1712. He entered the army, and was present at the battles of Fontenoy and Prestonpans. He was the first governor of Nova Scotia, 1749-52, and the founder of Halifax. He sat in the House of Commons for Eye, 1749, and for Westminster, 1753. He was subsequently governor of Gibraltar.

CORNWALLIS, Kinahan, American lawyer, editor, novelist, poet: b. London, England, 24 Dec. 1834. Educated by private tutors for the ministry of the Church of England, also at Collegiate Institution, Liverpool; later he studied at the School of Medicine, Liverpool, and Trinity College, but was then appointed to a British government post in Australia, and resided two years at Melbourne. He then returned to London and published there 10 volumes of his travels, novels and poems; was appointed to a post in British Columbia, resigned his British appointment, and soon afterward went to Washington as correspondent of the New York *Herald* with the newly arrived first Japanese Embassy to the United States, on an American warship. Then he went to the British provinces, and met the Prince of Wales on his arrival, and as the *Herald's* correspondent accompanied him everywhere till his departure for England in October. In November 1860 he published in New York and London his book of the tour 'Royalty in the New World; or The Prince of Wales in America.' He became Charles Reade's agent in America. Mr. Cornwallis remained on the *Herald* as financial editor and editorial writer nearly 10 years, and meanwhile bought and edited the old *Knickerbocker Magazine*. When he left the *Herald* he also bought and then edited *The Albion*, a weekly newspaper. In 1880 he established *The Wall Street Daily Investigator,* which he thereafter owned and edited for 25 years, at the same time practising law, having been naturalized, and admitted to the New York bar in May 1863. He had published the following books in London prior to 1860: 'An Australian Poem—Yarra Yarra'; 'Two Journeys to Japan' (2 vols.); 'A Panorama of the New World' (2 vols.); 'The New Eldorado, or British Columbia'; all the result of travel; also three novels — 'Howard Plunkett, or Adrift in Life' (2 vols.); 'Wreck and Ruin, or Modern Society' (3 vols.); and the 'Gittens Family: A Medley.' In 1861 appeared his 'Pilgrims of Fashion'; and 'Adrift with a Vengeance'; and 'A Marvellous Coincidence' followed. Then came two descriptive poems of one volume each embodying the history of America from the time of the Norsemen to the Civil War; viz., 'The Song of America and Columbus'; and 'The Conquest of Mexico and Peru,' to which a third volume was added later — 'The War for the Union, or The Duel Between North and South.' 'The History of Constructive Contempt of Court' while other publications on law and many magazine and newspaper articles and poems were also published by him here and in British periodicals. He is the oldest in membership in the Saint George's Society of New York.

CORO, kō'rō, or **SANTA ANA DE CORO,** Venezuela, town in the state of Falcon, near the Gulf of Coro, an inlet of the Gulf of Maracaibo, two and a fourth miles from the Caribbean Sea, on which is its port, Vela de Coro, about seven miles distant by railway. The trade was once considerable, but has now much fallen off; as is also the town since 1578, when the seat of government was transferred from it to Caracas. Coro contains several churches, interesting for their antiquity, though they either have been rebuilt or lie in ruins. La Vela, its port, has a good harbor and a trade with the Dutch West Indies and is the residence of a United States consular agent. Coro, one of the oldest cities in Venezuela, was settled by Juan de Ampués in 1527 and for a time was the Spanish capital of Venezuela. It was created the first bishopric of Venezuela in 1531, but subsequently the see was removed. It was the objective point of Miranda's first descent upon Venezuela in 1805, when he led an abortive expedition against the Spanish in the hope of precipitating the revolution of the Spanish-American colonies. Pop. 9,000.

COROADOS, kō-rō-ä'dōz, Indians of Brazil, the name being derived from their tonsures, just as the name Botocudo is applied to other aborigines of the same country who wear botogues or labrets. It is an arbitrary collective title for ethnic fragments whose tribal names have been lost. Tribes thus designated are found at the present day in some of the southern states of Brazil, especially in Paraná, Rio Grande do Sul, São Paulo and Matto Grosso; but only a few thousands remain in scattered groups, evidently representing different stages in development, though in a general way the Indians of the upper Paraná and upper Paraguay region may be classified as true aborigines, "the nearest representatives, and probably the direct descendants, of that primitive race whose osseous remains have been found in Lagoa Santa caves and Santa Catarina shell mounds." Consult Keane, 'Man, Past and Present'; Porter, 'Native Races.'

COROLLA, kō-rōl'a, the inner whorl of two series of floral envelopes, occurring in the more highly developed plants, the outer being the calyx. In all cases its divisions, which are called petals, alternate with those of the calyx. They are generally colored — that is, they are some other color than green. The corolla is, as a rule, larger than the calyx. When the petals of a corolla are all distinct, they are said to be polypetalous, and this is the normal type. When they cohere continuously by their margins they are called monopetalous, or, better, gamopetalous, meaning that the petals are joined. The petals of a corolla are really only modifications of leaves. The corolla merely assists reproduction by shading the productive organs from injury, and, in some cases, by secreting honey attracts bees and other insects to aid in their fertilization.

COROLLARY (Lat. "crown," or "garland," and in a derived sense "gift"; hence something given or granted), in logic, a proposition the truth of which appears so clearly from the proof of another as not to require separate demonstration.

COROMANDEL COAST, the east coast of the Indian Peninsula, between Calimere Point and the mouths of the Kistna. It is open, sandy and has no secure harbors; the surf, continually beating on it, renders landing difficult, often dangerous, and it is commonly accomplished in native boats of a peculiar construction. A violent monsoon accompanied by hurricanes blows from the middle of October well into April.

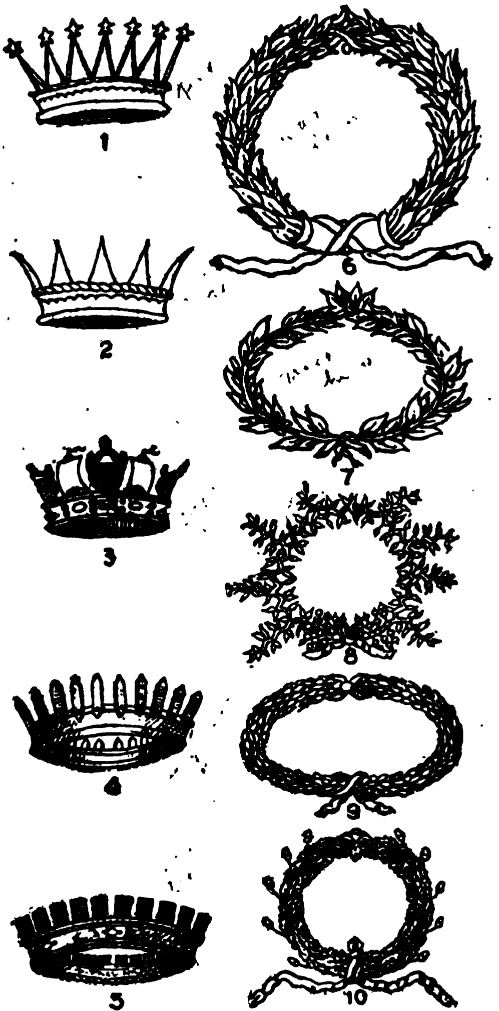
CORÓN, kō-rōn', Philippines. See PEÑON DE CORÓN.

CORONA, Cal., city in Riverside County, 50 miles southeast of Los Angeles, on the Santa Fe and the Pacific Electric railroads. It contains a city hall, high school, Carnegie library, the Woman's Improvement Club and a fine circular boulevard. It has extensive interests in citrus fruits, alfalfa milling, clay products and crushed stone. Great quantities of citrus fruits are shipped from Corona. Pop. 3,540.

CORONA. The crown of victory, termed *corona,* of the ancient Greeks and Romans, was what we, in this day, term a wreath. These coronæ come under the following classes: Those dedicated to the victors in peaceful contests and those voted for military achievement.

The crown or garland of the victor in the Olympian and the Pythian games was of laurel, that of the winner in the Nemean contests consisted of oak leaves, that of the Isthmian games was made from the pine tree.

The Roman coronæ were mostly military and termed «triumphal.» The most important were: *Celestial crown,* similar to the *Eastern crown* (see below), but having each *ray* surmounted by a small star. *Civic crown* (*corona civica*), composed of acorns and oak leaves, given as reward for saving a citizen's life in battle. *Eastern crown,* often termed *antique crown* (*corona radiata,* usually carries, above the gold circle, eight *rays*), is the Roman crown of apotheosis, but Great Britain has used it to honor successful statesmen in India and her Eastern dependencies, hence the term Eastern. *Laurel crown* (*corona laurea*), originally a martial crown, became a wreath of honor and distinction on civic occasions, and was composed of laurel leaves on their stem. *Myrtle crown* (*corona myrtea*), composed of myrtle leaves (myrtle was dedicated to Venus), was awarded to conquerors and used in wedding ceremonies, also placed upon the heads of the dead. *Mural crown* (*corona muralis*) was a circle of gold surmounted by pinnacles or battlements given for great prowess in scaling a wall and attacking the town within. *Naval crown* (*corona navalis* or *rostrata*) was a circle of gold surmounted by prows (*rostra*) of boats awarded to victorious sea warriors (the British nation also uses a naval crown composed of a gold rim surmounted by four ships' sterns and four sails alternating). *Obsidianal crown* (*corona obsidianalis* or *graminea*), composed of herbs or grass, awarded to a general who delivered a town from a state of siege. *Olive crown* (*corona oleagina*), composed of olive leaves, was a crown of martial victory, the olive tree being dedicated to Minerva. *Triumphal crown* (*corona triumphalis*), composed of *single* laurel leaves closely compact. *Vallary crown* (*corona vallaris* or *castrensis*), composed of a circle surmounted by palisadoes, was the honor conferred on the first warrior to pass the enemy trenched wall (*vallum*) or fence and enter the foe's camp or fortress (*castrum*).



1. Celestial Crown. 2. Corona Radiata—Antique or Eastern Crown. 3. Naval Crown (British). 4. Corona Vallaris. 5. Corona Muralis. 6. Corona Triumphalis. 7. Corona Laurea. 8. Corona Graminea or Obsidianalis. 9. Corona Myrtea Ovalis. 10. Corona Civica.

Among the ancient religious ceremonial crowns were the *coronæ funebres* or *sepulchres,* funeral chaplets of leaves and flowers; the *corona convivialis,* worn at banquets, etc., and the *corona natalis,* suspended over the door where a birth had taken place (at Athens olive for a boy, wool for a girl). The *nuptial crown* (*corona nuptialis*) was composed of flowers (verbena preferred) plucked by the bride herself. See CROWNS AND CORONETS.

CLEMENT WEBBER COUMBE.

CORONA (a crown), *in astronomy,* a halo or luminous circle round one of the heavenly bodies; specifically the portion of the aureola observed during total eclipses of the sun, which lies outside the chromosphere or region of colored prominences. (See HALO). *In botany* the corona is an appendage of the corolla in some flowers, coming as it were between the corolla and the stamens, well seen in the cup of the daffodil. *In architecture* it is the lower member of the projecting part of a cornice.

CORONA AUSTRALIS (the southern crown), one of Ptolemy's southern constellations, containing 49 naked-eye stars, varying from the third to the seventh magnitude.

CORONA BOREALIS (the northern crown), one of Ptolemy's northern constellations, situated near Hercules, and containing about 30 stars visible with the naked eye; *a,* known as Gemma, is of the second magnitude, the chief of a curved row of seven stars of the third, fourth and fifth magnitudes. In 1866 a new star of the second magnitude appeared in the constellation, but soon after became invisible save with a glass.

CORONACH. See CORANACH.

CORONADO, kō-rō-nä'dō, **Francisco Vasquez** de, Spanish explorer: b. Salamanca, Spain, about 1500; d. Mexico after 1542. He came to the New World about 1535, and by marrying the daughter of Estrada, the royal treasurer for New Spain, was appointed governor of the province of New Galicia. On the arrival in Culiacan of Alvar Nuñez, Cabeça de Vaca, from his extraordinary journey from Florida in the year 1536, when he brought news of the existence of half-civilized tribes far to the north, living in populous cities, acquainted with the arts, and possessing quantities of gold, silver and precious stones, an expedition was sent out under Marco de Niza, in 1539, to explore the regions referred to. The result tended to strengthen the belief in the existence of great wealth among the nations far to the north, and a second expedition was fitted out under Coronado, which departed from Culiacan, on the Pacific Coast, in April 1540. He passed up the entire length of what is now the Mexican state of Sonora to the river Gila. Crossing this he penetrated the country beyond, to the Little Colorado (called by him Rio del Lino), and paid a visit to the famed cities of Cibola mentioned by Cabeça de Vaca and De Niza. In the kingdom were seven cities, but he declares that there was no truth in the reports of his predecessors regarding their wealth. «All was quite the contrary,» he adds, «saving only the names of the cities and great houses of stone.» From Cibola, Coronado traveled eastward, visiting several towns occupied by a similar people to those he had met, which are recognized in the existing villages of the present Pueblo Indians. He proceeded eastward to what he calls the «big river,» which is the Rio Grande, where he heard of the great city of Quivira. In their journey eastward they «met with a new kind of oxen, wild and fierce, whereof, the first day, they killed fourscore, which sufficed the army with flesh.» They continued to Quivira, almost 300 leagues distant, by their account, traversing «mighty plains and sandy heaths, smooth and wearisome, and bare of wood.» Coronado's narrative is of value as it furnishes the first authentic account of the buffalo, the great prairies and the desert plains of New Mexico. It describes, too, with every appearance of truth, the towns of the Pueblo or semi-civilized tribes of Indians, as they existed more than 300 years ago, and which are still found in New Mexico. He returned to Mexico with such of his army as had not deserted along the route. The viceroy received him coldly and allowed him to resign the government of New Galicia. He lived quietly on his estates until his death. The original documents describing his journey are translated by Winship, 'The Coronado Expedition' (in the 'Fourteenth Report of the United States Bureau of Ethnology,' Washington 1896). Consult Winship, 'Journey of Coronado' (New York 1904).

CORONATION, the ceremonial rite of placing a crown on the head of a monarch as a symbol of his assumption of rule. The practice is one of great antiquity and in most countries has been followed in some form or other. Accompanying the crowning has been the anointing with oil, a custom that was followed in the dedication of the Hebrew kings, and is significant of consecration to the will of God. In England before the Norman Conquest the term employed was more «hallowing» than «coronation.» Egferth, Prince of Mercia, was «hallowed king» by Offa, his father, in 785; and the essential form of words employed has been altered little in the 12 centuries that have intervened; but various parts of the service employed in later times have been shortened and some omitted altogether. Thus the ceremonial, in the earlier days of the English monarchy performed at Kingston-on-Thames or Winchester, is in essentials the same as that now performed at Westminster. The recognition of the king as rightful lord is followed by a sermon, the anointing, the presentation of the ring as the symbol of kingly dignity and of the sceptre as the symbol of kingly power, the crowning, the presentation of the Bible, the enthronization, the homage. The service is one in which the religion of the nation is asserted; the covenant is one between God, the king and his people. In addition to anointing, the kings prior to the Reformation were signed on the head with chrism or sacred oil; and touching for the kings evil or scrofula was practised until the accession of the House of Hanover in 1714.

The ancient Scottish coronation stone — the Stone of Destiny — forms part of the coronation chair at Westminster. It was brought from Scone, where the Scottish kings were crowned, by Edward I in 1296. It is traditionally believed to have been the stone which Jacob used for a pillow, to have been brought to Ireland and from Tara, the site of the Irish coronations, to Scone; but the unimaginative Skene says that from its geological composition it must have been quarried from rocks near Scone.

There have been variations in the oath taken from time to time. The declaration which was introduced in 1678 under the excitement produced by the so-called Popish Plot continued almost unabated down to the time of the last coronation, that of George V, 22 June 1911. That oath, aimed at securing a Protestant sovereign and the safeguarding of the Protestant Succession, expressly repudiated two cherished doctrines of the Roman Catholic Church — invocation of the Virgin Mary and the saints and transubstantiation. Subscription to this oath was given as the reason by George III and George IV why they would not consent to Catholic emancipation. King Edward VII wished to be relieved from that part of the oath which was offensive to his Catholic subjects; but an attempt at emendation before his coronation fell through. The subject was again brought up before the crowning of George V, and by the Accession Oath Act of 1910 the objectionable phrases were withdrawn, and the king simply pledges himself as a «faithful member of the Protestant Reformed Church of England,» to secure the Protestant succession «according to law.»

In honor of Charlemagne, the emperors of Germany were always crowned at Aix-la-Chapelle, in the church which he founded. Thirty emperors were crowned there, and until 1793 the regalia and robes were preserved there. The kings of France were crowned at Rheims and their queen consorts at the church of Saint Denys, near Paris; those of Spain, at Toledo or Madrid; of Poland, at Guezna; of Hungary, at Pressburg; of Scotland, at Scone; and the native kings of Ireland, at Tara. The recent kings of Denmark have been crowned at Fredericksburg; those of Sweden at Upsala, and the emperors of Russia, at the Kremlin, Moscow. Consult Johnston, W. F., 'The Coronation of a King; or, Ceremonies, Pageants and Chronicles of the Coronations of All Ages'

(London 1902); and Perkins, Jocelyn, 'The Coronation Book; or, the Hallowing of the Sovereigns of England' (London 1911).

CORONATION CHAIR, the ancient throne in Westminster Abbey used at the coronation of English kings since Edward I. Beneath the seat is the Lia Fail, or Stone of Destiny, on which Scotland's kings were crowned. The stone is said to have been used by Jacob as a pillar, and to have been in Tara, the residence of the high kings of Ireland, after the 5th century B.C. It was brought to Scotland many centuries later and thence to England by Edward I. Celtic tradition has it that political supremacy goes to the people in whose territory the stone rests.

CORONATION GULF, an inlet on the northern coast of British America into which empty the waters of the Coppermine River. It is north of the Arctic circle and included between long. 107° and 116° W. Bathurst Inlet is an extension toward the southeast. It is connected with other Arctic channels by Dease Strait on the northeast and Dolphin and Union Strait on the northwest. It is studded with islands.

CORONEA, kŏr-ō-nē'ạ, a small town of Bœotia (q.v.), southwest of Lake Copias, where in 447 B.C. the Bœotians defeated the Athenians and became the leading state of Greece; and in 394 Agesilaus defeated the allied Greeks. The town is now in ruins.

CORONEL, Chile, a port in the province of Concepción, on the Araucobai River, important on account of its coal mines. The customs receipts average about 700,000 pesos per annum. It is a coaling station. Pop. 5,258.

CORONEL, Battle of. A naval engagement fought 1 Nov. 1914 off the coast of Chile between a British squadron under Rear-Adm. Sir Christopher Cradock (q.v.) and the German Pacific squadron commanded by Admiral von Spee. Cradock's four vessels — two armored cruisers, one light cruiser and an armed liner — were no match in regard to speed and range for the German squadron of five vessels. The *Good Hope, Monmouth* and *Otranto* were sunk; only the light cruiser *Glasgow* escaped. Admiral Cradock went down with 1,650 officers and men. On 8 Dec. 1914 four vessels of von Spee's squadron were destroyed by the British off the Falkland Islands, and the fifth, the *Dresden,* was sunk off Juan Fernandez on 14 March 1915. See WAR, EUROPEAN — NAVAL OPERATIONS.

CORONER, a functionary whose name coroner, or crowner, implies that he has principally to do with pleas of the Crown or in which at least the Crown is concerned. His office is very ancient, mention being made of it in 925 A.D. His office in England was peculiarly a county institution. In Alfred's time he was appointed by the king, but since Edward I's time the office has been elective. His duties originally had to do with inquiries into fires and cases of wreckage and of sudden death, but now his court is a court of record in which, after sight of the body of one who has died in prison, or so suddenly that suspicions of violence may be excited, a jury summoned for the purpose pronounce a decision as to the cause of death. The proceedings under the auspices of the coroner prepare the way for a criminal prosecution. He also officiates as a sheriff's substitute when the sheriff himself is interested in a suit and cannot therefore act in it himself. In the United States the coroner is an elective county officer. His duties are similar to those of a coroner in England. Generally he has no right to inquire into the cause or origin of a fire except when death has resulted from it, but by statute in some States he has the power and duty to investigate the causes and origins of fires which appear to be of incendiary origin. Consult 'Encyclopedia of the Laws of England' (Vol. III, London 1897); Binmore, 'Instructions for Sheriffs, Coroners and Constables' (2d ed., Chicago 1894); Smith, B. D., 'Powers, etc., of Coroners' (2d ed., Albany 1897); Jarvis, 'Office and Duties of Coroners with Forms and Precedents' (5th ed., London 1888); Boys, 'Treatise on Coroners' (Toronto 1893).

CORONETS. See CROWNS AND CORONETS.

CORONIS, (1) in Greek mythology, the daughter of King Phoroneus, whom Neptune loved, and who was changed into a crow by Athena whom she had begged for protection from Poseidon; (2) the daughter of Phelegyas and the mother of Asclepius.

CORONIUM, a hypothetical chemical element, supposed (by some astronomers) to exist in the sun. The evidence in favor of its existence consists in certain bright lines that are seen in the spectrum of the solar corona at the time of a total eclipse, and which are not known to be due to any recognized terrestrial element. On account of the great height above the sun's surface to which the matter that gives these lines extends, coronium has been assumed to be far lighter than hydrogen, which is the lightest known terrestrial element. Certain French and Italian scientists have reported the discovery of coronium in terrestrial volcanic gases; but their results need confirmation, and the existence of the supposed element, even in the solar atmosphere, has not yet been demonstrated. A line not very remote from the coronium line has been found in the spectrum of the aurora, so that certain scientists suppose that the upper layers of the earth's atmosphere contain a new element, geocoronium, much lighter than hydrogen.

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